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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

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JAPAN LESSONS LEARNED PROJECT DIRECTORATE

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PUBLIC MEETING

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WEDNESDAY, SEPTEMBER 18, 2013

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The meeting was convened in the
Commissioners' Hearing Room, One White Flint North,
11545 Rockville Pike, Rockville, Maryland, at 10:00
a.m., Lance Rakovan, moderating.

PRESENT:

BRIAN SHERON, Director, Office of Nuclear Regulatory
Research

JENNIFER UHLE, Deputy Director for Reactor Safety
Programs, NRR

HOSSEIN ESMAILI, Senior Reactor Systems Engineer

STEVEN JONES, Senior Reactor Systems Engineer, DSS

JOSE PIRES, Senior Technical Advisor for Civil
Engineering

KEVIN WITT, Project Manager, Japan Lessons Learned
Project Directorate

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NRC STAFF PRESENT:

LANCE RAKOVAN

SCOTT BURNELL

KEITH COMPTON

LYNNE FINCH

LAUREN GIBSON

A.J. NOSEK

FRED SCHOFER

RANDY SULLIVAN RALPH WAY

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P R O C E E D I N G S

10:02 a.m.

MR. RAKOVAN: Hi, good morning, everyone.
That is Roy, who is going to be assisting us with the phone
lines today.

My name is Lance Rakovan. And I'm going to
be assisting with the facilitation today, in that I hope
to make the meeting productive for everyone involved.

My associate, Lynne Finch, is going to be
helping me out from time to time with that, especially
given that we are scheduled to have such a long meeting
today.

The purpose of today's meeting is to provide
stakeholders with information on, one, the NRC staff's
activities regarding whether regulatory action is needed
to require expedited transfer of spent fuel to dry cask
storage.

And, two, the use of the spent fuel study
and other sources of information in the staff's
assessments.

Our agenda is fairly straightforward.
We're going to have some welcoming opening comments from

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1 the NRC staff.

2 We're going to go through, hopefully, a
3 brief presentation that covers some of the information
4 so that anyone here who isn't well read on these materials
5 can at least get a brief overview of what the topics are
6 today.

7 And then we're going to be opening it up for
8 questions and comments. Now, we do have a number of
9 people who signed up ahead to speak. And so we'll give
10 those folks a time at the microphone first, asking if
11 folks can limit themselves to ten minutes or less when
12 they have a chance at the microphone.

13 Hopefully, that'll give us a chance to get through
14 everyone today. Again, we have until 5 o'clock.

15 And if we're able to open it up again and
16 give folks another chance once they've had their initial
17 time at the microphone, then we'll certainly be willing
18 to do that.

19 We are using numerous participation
20 technologies today. As you can tell, we have a telephone
21 line. Lauren is going to be running our webinar, and so
22 she's going to be helping us out with that. And we're
23 also webcasting today.

24 So it's very important that we make sure
25 that everyone who's participating in this meeting can

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1 hear and follow the discussions.

2 If anything's going on, especially in the room,
3 that's causing additional noise, Lynne or I will probably
4 step in and ask you to take a side conversation outside.

5 If you didn't turn off or put your
6 electronic device on vibrate, I suggest you do it now.
7 We shouldn't have any problems with the phone systems,
8 because we are going to be keeping folks on mute until
9 we open up the phone lines when we give them the floor.

10 We will be taking breaks, especially a break
11 for lunch and then probably a break or two in the
12 afternoon, depending on how folks are doing and what the
13 energy level is like.

14 So we'll be going into those and then
15 formally taking a break for those. For those of you in
16 the meeting room, if you haven't been here, restrooms are
17 just out the door here and then to your left. There's
18 also a little café over there. Emergency
19 exits are on pretty much all sides of the room to the right
20 or to the left. So in case anything happens, please
21 proceed quietly and orderly to one of the exits if you
22 would.

23 We do have copies of NRC's talk at both sides
24 of the door. And we also have sign-in sheets and public
25 meeting feedback forms. For those of you online, you

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1 should have access to those through the public meeting
2 website or notice site. Kevin knows we're posted,
3 correct? Yes, okay. Just wanted to check.

4 I'd like to introduce our speakers who are
5 at the table today. Brian Sheron is our director of the
6 Office of Nuclear Regulatory Research at the NRC.

7 Jennifer Uhle is our deputy director for reactor
8 safety programs, Office of Nuclear Reactor Regulation.

9 Hossein Esmaili is our senior reactor
10 systems engineer. And he'll be presenting the slides
11 specifically involving the spent fuel study.

12 Kevin Witt is the project manager in the
13 Japan Lessons Learned Project Directorate. He's going
14 to give the background for the activity. And he's
15 responsible for coordinating staff activities involving
16 this issue.

17 Steve Jones is as senior reactor engineer
18 in our division of safety systems. He's going to be
19 addressing some of the spent fuel questions.

20 And finally at the table we have Jose Pires.
21 He is a senior technical advisor for civil engineering,
22 and he's here to answer some of the spent fuel study
23 related engineering questions.

24 So having said all that, what I will do is
25 I will turn it over so we can give a welcome. I will be

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1 back once we are done with the NRC presentation.

2 Again, we ask that you hold all your questions and
3 comments until we're done with our presentation. That
4 way, we can open it up and we will start with the folks
5 who signed up previously to speak. So Jennifer, if you
6 would?

7 MS. UHLE: Thanks, Lance. Welcome,
8 everybody. Good morning. We're looking forward to
9 answering any questions you may have at the end of our
10 presentation and certainly interested in hearing your
11 comments.

12 Just to give a bit of a background, the
13 agency has done numerous studies on spent fuel pools
14 safety since really the 1980s.

15 Now, post-Fukushima, there was enhanced
16 public concern about spent fuel pool safety. And the
17 agency took a number of actions to address those
18 concerns.

19 Now, the Fukushima events did not result in
20 any loss of inventory or caused any kind of heat-up in
21 any of the spent fuel pools affected. Nonetheless, we
22 still wanted to study this to determine if any regulatory
23 action was warranted.

24 So Brian Sheron, to my left, the director
25 of the Office of Research, initiated work to determine

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1 if there was any benefit and, if regulatory action was
2 warranted, to expedite the movement of spent fuel into
3 ISFSIs or dry cask storage.

4 And we'll be hearing more about those
5 results of that study. And it's called the spent fuel
6 pool study. Now, we also did a bunch of lesson learned
7 activities after Fukushima to look at our regulatory
8 framework.

9 And we have numerous actions underway. The
10 staff added another activity to also address whether or
11 not the expedited transfer of older spent fuel from the
12 spent fuel pool was warranted.

13 And we plan to use, we are using the results
14 from the spent fuel pool study that was focused on a
15 particular reactor design that was very similar to the
16 Fukushima Daiichi reactors.

17 But we recognize there are other types of
18 reactors across the fleet in the United States. So we've
19 expanded some of the analyses and did additional studies
20 to determine whether or not any regulatory action is
21 warranted across the rest of the fleet.

22 So we will be talking about that activity
23 as well. And we've referred to that as the Tier 3
24 activity. The reason why it's Tier 3 is when we looked
25 at all of the actions after Fukushima we binned them into

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1 three different tiers. And this additional activity on
2 the expedited transfer of fuel is in the Tier 3. So we
3 used that.

4 And I just want everybody to be comfortable
5 with that term to distinguish between the Tier 3
6 activity, which is broader and is looking at all of the
7 reactor designs across the fleet using a number of data
8 points, including the spent fuel pool study that Brian
9 will be talking about, in addition to the other studies
10 that we had done, again, since the 1980s, like I talked
11 about before.

12 And then that is, again, in contrast to what
13 we call the spent fuel pool study, which is a detailed
14 study focused on the BWR Mark I, Mark II designs, which
15 were at Fukushima.

16 So at this stage, I'll turn it over to Brian.
17 And he can talk a little bit more about the spent fuel
18 pool study that was done in the Office of Research.

19 And then we will open up and start with the
20 more formal presentation. We hope to finish that
21 quickly so we can get to your questions as well as your
22 comments. Brian?

23 MR. SHERON: Thanks. I'm Brian Sheron,
24 the director of the Office of Nuclear Regulatory
25 Research. The question we wanted to answer, as Jennifer

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1 had said, by the study, was is there a substantial
2 increase in public health and safety, or conversely a
3 substantial decrease in risk by the expedited transfer
4 of spent fuel to dry casks.

5 The regulatory analysis that Jennifer
6 mentioned that her office will be doing, or has been doing
7 on this, used information from our study, as well as from
8 past studies, to answer the question within our
9 regulatory framework to determine if any regulatory
10 action is needed or recommended to our Commission.

11 Staff briefed the ACRS, both the full and
12 the sub-committees, multiple times on this study as it
13 proceeded. Following the meeting between the ACRS and
14 the Commission, the Commission directed the staff to add
15 several additional items to the study.

16 These included a human reliability
17 analysis, a comparison between the results of the study
18 and the previous -- I'm sorry -- included a human
19 reliability analysis, a comparison between the results
20 of this study and the previous large seismic events
21 affecting Japanese nuclear power plants as well as a
22 comparison of the results of previous studies on spent
23 fuel pools.

24 These have been completed and were added to
25 the report over the past year. Following a detailed

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1 review of the draft report and a final briefing by the
2 staff in July of 2013, the ACRS concluded that the spent
3 fuel pool study had been performed in a thorough and
4 systematic manner.

5 The study demonstrated that the health
6 effects from a seismically initiated spent fuel pool
7 damage scenario are very low for both low density and high
8 density pool loadings.

9 They agreed with the staff's conclusion
10 that the expedited transfer of spent fuel from the pool
11 to dry cask storage does not provide a substantial safety
12 enhancement for the reference plan. They
13 concluded that the spent fuel pool should be issued. And
14 they concluded that the spent fuel pool provide sound
15 approaches, tools and insights for a broad evaluation of
16 the consequences of severe seismic events on spent fuel
17 pools of different design and will be valuable in
18 determining whether expedited transfers to dry cask
19 storage is a substantial safety benefit for U.S. PWRs and
20 BWRs.

21 The same draft report was provided for
22 public comment during the month of July 2013. My staff
23 is reviewing the comments and will provide responses in
24 an appendix that is being added to the final report.

25 The final report will be provided to the

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1 Commission on or before October 11th. And my staff and
2 I look forward to your questions about the study. Thank
3 you.

4 MR. WITT: Good morning. My name is Kevin
5 Witt. I'm a project manager in the Japan and Lessons
6 Learned Project Directorate in the Office of Nuclear
7 Reactor Regulation. I'll be going through the slides on
8 the Tier 3 analysis.

9 Second slide, please. During our meeting
10 today we intend to go over the objective for this meeting,
11 give a brief background on these activities, talk about
12 the spent fuel pool study, which is the research activity
13 that Brian has spoken about.

14 And then we'll talk about the regulatory
15 analysis, which is the generic analysis that we've
16 conducted for this Tier 3 issue for all spent fuel pools.
17 And then finally we'll talk about the next steps.

18 Next slide, please. The objectives of the
19 meeting today are to talk about the spent fuel pool study
20 which was conducted by the Office of Research. In the
21 slides we'll be referring to this as the study, shorthand
22 for that term.

23 Subsequently, we'll be talking about the
24 activities on the Japan Lessons Learned Tier 3 activity
25 on expedited transfer of spent fuel. This is the generic

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1 analysis that we've done for the Tier 3 issue.

2 In addition to that, we'll talk about how
3 this study's analysis and past studies were expanded upon
4 to make it applicable to all spent fuel pools.

5 And finally, at the end of the presentation,
6 we'll provide extended time for stakeholders to ask
7 questions or provide any remarks. Next slide,
8 please. The spent fuel pool study was initiated in July
9 of 2011 following the Fukushima event in March of 2011.
10 Subsequent to that, this Tier 3 issue was established as
11 a Japan Lessons Learned item.

12 And we established a plan to address this
13 issue in a memorandum to the Commission. Subsequent to
14 those issues being initiated, we received several
15 direction memorandums from the Commission known as staff
16 requirements memorandum.

17 As Brian mentioned, one of those SRMs, staff
18 requirement memorandum, directed the staff to do some
19 additional research in the spent fuel pool study.
20 Another staff requirements memorandum from the
21 Commission directed the staff to do an international
22 comparison of spent fuel management practices.

23 So subsequent to that, we sent an updated
24 plan back to the Commission which includes a
25 consideration of this information in addition to

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1 consideration of the ongoing Waste Confidence activities
2 in our schedule so that we can provide the information
3 to our stakeholders to allow them to be engaged in all
4 of these activities.

5 Next slide, please. This slide gives a
6 brief overview of all of the activities that we're
7 talking about today.

8 The first issue is the spent fuel pool
9 study, which we've spoken about numerous times. And
10 this study was a specific consequence study on a specific
11 boiling water reactor, a Mark I design reactor for a
12 specific scenario, and that's a seismic event.

13 Subsequent to that analysis, we did a
14 regulatory analysis, which was contained in the spent
15 fuel pool study in Appendix D of that document.

16 The regulatory analysis, it takes the
17 consequences that were calculated in that consequence
18 study and applies it to the regulatory framework. It
19 also takes additional considerations into account,
20 including other types of initiating events to expand it
21 out slightly for that study.

22 Subsequent to that document, we did a more
23 expanded analysis which applies to all spent fuel pools.
24 And that's the generic regulatory analysis. That's the
25 Tier 3 analysis that we'll be speaking about later.

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1 I'll turn it over to Hossein now, who will
2 talk about the spent fuel pool study.

3 MR. ESMAILI: Good morning. My name is
4 Hossein Esmaili. I'm with the Office of Research.
5 Slide 6.

6 As was mentioned before, the objective of
7 the study was to determine whether accelerated transfer
8 of spent fuel pool from the pool to dry cask storage can
9 significantly include public health and safety.

10 To this, site gives updated publicly
11 available information regarding the consequences where
12 beyond design basis earthquake that can affect a spent
13 fuel pool.

14 And we did the analysis for both high
15 density and low density loading conditions. The study
16 will be used as one input to inform the regulatory
17 decision making process.

18 Next slide. So what do we mean by reference
19 plant? We started with a specific spent fuel pool. At
20 the reference plant we chose the BWR with the Mark I
21 containment, which is similar to what Fukushima has. It
22 has an elevated pool design.

23 There were a number of reasons we chose this
24 plant. It was availability of information,
25 availability of models and similarity to Fukushima.

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1 Going from a high density to the low density, we
2 assumed that there's a high density pool raking. But in
3 the low density case we removed the fuel that was older
4 than five years.

5 The study was specific for a BWR. And the
6 BWR have channel boxes, so the BWR operation with the
7 channel boxes would impede any crossflow, even with the
8 open rack system.

9 The initiating event was a severe
10 earthquake. This was found, that the previous study
11 consistently showed that this was the largest
12 contributor to risk. So we chose that as our input for
13 the study.

14 It's a very rare event. It's expected to
15 occur about once in 60,000 years. And during the past
16 six years the earthquakes in Japan -- there are 20
17 Japanese nuclear reactors and spent fuel pools were
18 subjected to these severe earthquakes. But none of them
19 have leaked.

20 Next slide. In order to provide the
21 initial and boundary condition for any accident
22 progression, we had to do a detailed structural analysis
23 for the earthquake that was studied.

24 This was to determine the potential leak
25 sizes. We determined leak sizes to be up the order of

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1 small leaks that can take tens of hours to large leaks
2 which can happen on the order of hours and the location
3 of the leak.

4 The study found out that the potential leak
5 is due to the liner tearing at the bottom. So this leads
6 eventually to a complete drain-down of the pool.

7 And the analysis showed that there is no
8 liner failure at any other location. And so partial
9 drain-down was not credible for this particular event.

10 We used MELCOR and MACCS, because they are
11 the state-of-the-art computational tool for accident
12 progression and consequence estimates. These codes
13 have been in development for decades. There have been
14 comparisons and experiments, "comparisons, et cetera."
15 So we feel that the codes are on a par for this analysis.

16 Regarding mitigation, we assumed scenarios
17 with and without successful mitigation. This, we felt,
18 that reasonably characterizes the range of releases that
19 we can get.

20 For the truncation time, we chose a three
21 day truncation time. And once the question comes up,
22 we'll get into that a little bit later.

23 Slide 9. Following the structural
24 analysis we found out that there is a low probability of
25 damage to the pool. Ninety percent of the time the pool

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1 is going to survive. Ten percent of the time the pool
2 is going to develop a leak at the bottom of the pool.

3 And the accident progression analysis
4 showed that even if a leak occurs, the spent fuel pool
5 is hot only for the first few months after the fuel is
6 moved. Otherwise, it's going to be cooler for at least
7 the 72 hours that we did the analysis.

8 Regarding the frequency of release, there
9 are releases occurring whether it's going to be a high
10 density and low density. It's dominated by the newly
11 discharged fuel. But, of course, high density loading
12 has higher inventory, so you have higher, larger
13 releases.

14 Slide 10. At the conclusion, it has been
15 stated before the public health and environmental effect
16 estimates are generally the same and were smaller than
17 aerial studies.

18 There's a section in our study that does a
19 comparison with earlier estimates. And so the study,
20 together with the previous research, confirms that spent
21 fuel adequately protects public health and safety. And
22 the regulatory analysis for the reference plant
23 indicates that expedited transfer is not cost-justified.
24 Going back to Kevin.

25 MR. WITT: Thank you. On Slide 11, we have

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1 another repeat of the previous slide where we talked
2 about an overview of all of these activities including,
3 as Hossein just talked about, the spent fuel pool study.

4 Now, as I mentioned before, the regulatory
5 analysis in that study indicated that expedited transfer
6 for that reference plant did not indicate a substantial
7 increase in public health and safety.

8 The generic regulatory analysis, which
9 we'll talk about on Slide 12 -- I guess we could go to
10 Slide 12 here. So the analysis that we did on the spent
11 fuel pool study was expanded slightly in Appendix D to
12 include consideration of another initiating event to do
13 a more holistic look at what could potentially impact a
14 spent fuel pool and how that would be considered under
15 the regulatory framework.

16 This includes the consideration of issues
17 such as a cask drop, which is a situation where a plant
18 may be loading a cask in a spent fuel pool and the cask
19 somehow drops and causes damage to the pool, a loss of
20 power, which may be a situation where the heat removal
21 capabilities of the spent fuel pool may be lost.

22 So we considered what would happen in that
23 situation, including a partial drain-down scenario. We
24 included that in our analysis by looking at cases where
25 the loss of water in the pool may be limited to somewhere

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1 in between the bottom and the top of the spent fuel
2 assemblies.

3 From that analysis that we did on the spent
4 fuel pool study, we expanded that out to all operating
5 reactors, including new reactors. And by operating
6 reactors, I mean all boiling water reactors and
7 pressurized water reactors.

8 And we also looked at new reactors such as
9 the advanced pressurized water reactor, which has a
10 combined operating license.

11 The security events were not addressed in
12 this Tier 3 analysis as they had been assessed outside
13 of this Tier 3 analysis. So that was not included in our
14 regulatory analysis that we conducted.

15 Next slide please. The preliminary
16 findings that we've determined from our analysis are that
17 expedited transfer of spent fuel to dry cask storage does
18 not appear to provide a substantial increase in overall
19 public health and safety.

20 That means that we have the criteria for
21 determining whether to proceed with a regulatory action
22 based on risk numbers or public health and safety
23 criteria. And the analysis did not leap to that level.

24 In addition, we looked at the safety
25 benefits and the costs. And it appears that the benefit

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1 does not outweigh the associated cost.

2 The staff's current position is to not
3 pursue expedited transfer of spent fuel to dry cask
4 storage. And we are still finalizing this analysis, but
5 this is our current position based on the expanded
6 analysis that we've conducted.

7 And it appears that we will recommend to the
8 Commission that we close this Japan Lessons Learned Tier
9 3 activity. And now I'll talk about steps that we'll
10 take following this meeting.

11 Next slide please. So after this meeting,
12 we plan to release the analysis that we've conducted for
13 all spent fuel pools to the public for their review by
14 next week. That is undergoing final review by the staff
15 at this point, staff and management, and we expect that
16 to be released next week.

17 Following the release of that document, we
18 have a meeting with the Advisory Committee on Reactor
19 Safeguards. That meeting is open to the public, and
20 that's scheduled for October 2nd.

21 Following the advisory committee meeting,
22 we'll be sending these papers up to the Commission. And
23 that includes the Tier 3 analysis and the spent fuel pool
24 study. And those papers will be sent to the Commission
25 on or before October 11th.

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1 The Commission has also indicated that they
2 plan to hold a meeting on this issue by the end of 2013.
3 And that would be a meeting on spent fuel safety. So
4 there will be plenty of opportunities for the public to
5 be involved in these issues.

6 That concludes the presentation. I think
7 we can open the floor now to questions.

8 MR. RAKOVAN: Okay. Thank you all. I
9 think what we'd like to do now is start going through the
10 list of folks who signed up to speak. I again ask that
11 people take ten minutes or less if it's possible.

12 If we get through everybody who wants to have some
13 time at the microphone, whether here in the room or on
14 the phone lines, and we have a chance to rotate again
15 through or give people a second chance at the microphone,
16 we're willing to do that.

17 I'd like to start with Diane Curran. I
18 believe you, and you had a group actually that would like
19 to speak, if you guys want to go first, please.

20 MS. CURRAN: Thank you very much. I
21 represent 26 environmental groups across the country
22 that are very concerned about the issue of spent fuel
23 storage risks and high density storage pools.

24 And so this opportunity to talk to you is
25 very important to my clients, many of whom are listening

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1 on the telephone. This is the second go around of a
2 meeting with you all, and we appreciate your taking the
3 time to have another meeting.

4 I have some questions in general about how
5 this study was done. I think you're all familiar with
6 the comments that my clients submitted, prepared by Dr.
7 Gordon Thompson, which are very critical of this study
8 and the scope of the study, the assumptions used in the
9 study.

10 And I would just like to get a better idea
11 of how it came about. The first thing I want to ask, it
12 looks to me, based on the introductions, that there's
13 only two of the authors of the study that are at the table
14 this morning, is that right, Mr. Esmaili and Mr. Pires?
15 Is that right?

16 MS. UHLE: Yes. So we have a number of
17 staff available in the audience. So if you have specific
18 questions, if we need to then we can go to the staff here
19 in the room today.

20 MS. CURRAN: Okay, terrific. And of
21 course, one of our concerns is the assumption that, well,
22 this study looked at total drainage of a spent fuel pool.
23 And we're really concerned that a more severe case is
24 posed by partial drainage.

25 And today was the first time that I focused

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1 on the issue, I guess it was raised here, that in Appendix
2 D the staff did say something about partial drainage.

3 And my understanding at the August 22nd
4 meeting was that the draft consequence study was prepared
5 by the Office of Research and that Appendix D was prepared
6 by NRR, reactor regulation. Is that correct?

7 MR. WITT: That's correct, yes.

8 MS. CURRAN: So the research group didn't
9 -- I just want to confirm -- they didn't look at the issue
10 of partial drainage to try to understand it better, that
11 sort of thing.

12 MR. WITT: Well, there's a broad history of
13 research into spent fuel pool safety. And what we did
14 on the regulatory analysis in Appendix D was take a
15 variety of studies that we've done over the years to
16 inform the analysis that we did in the regulatory
17 framework, which includes a partial drain-down.

18 MS. CURRAN: But the people in the Office
19 of Nuclear Regulatory Research were not involved in the
20 preparation of that part of the study, right. Is that
21 correct?

22 MR. ESMAILI: No, we were not. And as was
23 said before, this was when we started the project there
24 was no regulatory analysis. This was added on after we
25 started the project.

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1 So as ACRS said, the study was done in a very
2 systematic manner where we looked at the assumptions, we
3 looked at -- more specifically to your question, looked
4 at the damage state to the pool.

5 And Jose Pires was sitting right next to me.
6 He did a very, very detailed analysis of the structural
7 response of the pool. And he found that the partial
8 drain-down was not credible for this scenario, for the
9 specific scenario.

10 And so to that effect, and then that
11 provided the input and boundary conditions for what we
12 do for accident progression, which we did. And so it was
13 a very, very systematic manner in which we did the study.

14 The regulatory analysis was done after the
15 study was almost actually completed. So it was not
16 influenced by anything in the regulatory analysis. We
17 stand by the fact that for this spent fuel pool, we don't
18 think a partial drain-down is credible.

19 MS. CURRAN: Okay. And in the slides this
20 morning, it was made pretty clear that the objective of
21 the study is very broad, to determine whether there's,
22 as you were saying, a safety benefit to be achieved from
23 expedited transfer of spent fuel.

24 My question is how was it decided that in
25 order to make that evaluation that the subject, the

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1 scenario evaluated, would be a severe earthquake? Who
2 made that decision and how was it made?

3 MR. ESMAILI: Well, this was based on
4 previous studies, previous studies have consistently,
5 NUREG - 1738, NUREG - 1353, have consistently said that
6 the biggest contributor to risk is a severe accident.
7 This is, by far, the orders of magnitude higher than the
8 other initiating frequencies.

9 As a matter of fact, in Appendix D, in the
10 regulatory analysis we do list the other initiating
11 events with the frequencies associated with them. That
12 was taken directly from 1738.

13 So we chose the severe earthquake because
14 we wanted to see if it's going to cause damage. We knew
15 that other less severe earthquake is not going to provide
16 damage, so we wanted to push it to the case where we do
17 damage the pool and see what the consequences are.

18 MS. CURRAN: So you didn't start with a
19 question of what could cause fuel to burn. You started
20 with the question of what could cause effects on the pool,
21 a crack in the pool.

22 MR. ESMAILI: That's right. Because
23 that's --

24 MS. CURRAN: Okay.

25 MR. ESMAILI: Yes.

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1 MS. CURRAN: And this is in a -- I'm just
2 looking at the assumptions on Page 19. The first one is
3 the beyond design basis earthquake is assumed to occur.
4 I'm just trying to understand why, when the purpose is
5 to figure out what are the risks of fire in a pool --

6 MR. SHERON: Let me --

7 MS. CURRAN: -- why, I'm sorry?

8 MR. RAKOVAN: Brian, if you could identify
9 yourself.

10 MR. SHERON: Go ahead and finish.

11 MS. CURRAN: Why then was that not the
12 question that you technically analyzed? Instead you
13 technically analyzed what would be the most severe
14 accident that would damage the pool. I'm just curious.
15 How does decision that made?

16 MR. SHERON: Well, what started this, and
17 maybe I can help a little bit. Right after the accident
18 at Fukushima, the NRC received a number of letters from
19 members of Congress, from members of the public, all sort
20 of saying, gee, why aren't you requiring licensees to
21 move all their fuel to dry casks immediately.

22 It wasn't clear, even though that may appear
23 to be an obvious improvement, it wasn't clear necessarily
24 from a risk standpoint. And we've learned in the past
25 that a lot of times things you think are safe or safer

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1 really may not be, or they may not be providing the
2 increase in safety that you think.

3 I proposed that my office look at whether
4 there was a substantial benefit, reduction in risk, from
5 the expedited transfer. The way we approached it was to
6 say, okay, what events, how do damage a spent fuel pool?
7 How do you cause a radioactive release from a pool?

8 When we went back and we looked at previous
9 risk studies, everything indicated that in order to get
10 a release from a pool you have to overheat the fuel, which
11 means you have to drain the pool. You have to somehow
12 lose the coolant in there.

13 MS. CURRAN: By losing all the coolant?

14 MR. SHERON: Huh?

15 MS. CURRAN: All the coolant?

16 MR. SHERON: No, not all the coolant, not
17 necessarily.

18 MS. CURRAN: Is it not now understood that
19 the partial drainage accident is most dangerous for a
20 spent fuel pool because of the loss of cooling capacity?
21 Is that now not understood?

22 MR. SHERON: It's understood. But the
23 point is what is the likelihood of getting a partial
24 drain-down, in other words, failing the pool at some
25 intermediate location versus where it did fail.

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1 And I would have to defer to Jose. He can
2 explain that when they looked at, and they postulated,
3 and they went through and they explained the scenario
4 that they postulated. In other words, how can I crack
5 the pool?

6 Well, I postulated an earthquake. And they
7 postulated an earthquake that they felt was
8 substantially large, well beyond a design base. And
9 then they analyzed it using state of the art techniques.
10 And the failure occurred where they did. Now, Jose, you
11 can maybe add on if you want.

12 MR. PIRES: Yes. Once we assumed that a
13 seismic event is going to happen, a very strong seismic
14 event, the seismic event that we considered in the study,
15 then you calculate what are the loads that the event
16 applies to the pools.

17 MS. CURRAN: But I'm just trying to get at
18 why did you make that assumption. You're in charge of
19 figuring -- did you have free rein to look at this problem
20 of how is the fuel most likely to be compromised? What
21 is the most likely cause of the fire?

22 MR. PIRES: Right.

23 MS. CURRAN: Did you have freedom to do
24 that?

25 MR. PIRES: Yes. We had it. The staff,

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1 they had technical discussions among themselves when the
2 study was starting to see what scenario do we need to
3 analyze.

4 And by scenario, it's not partial
5 drain-down or full drain-down. The scenario is what is
6 there out there that can lead to a condition in which you
7 start losing water.

8 This could have been partial water loss or
9 complete water loss. We didn't know a priori was going
10 to be. We just knew that we needed to lose water to have
11 releases.

12 So we said what events can do that. We
13 examined the past studies, and the conclusion was
14 overwhelming that the seismic event would be the
15 contributor to risk. So we have also separately chosen
16 what pool to analyze. And the pool that we chose to
17 analyze was a Mark I.

18 Then we started the process of analyzing
19 that. Like I say, what is going to be the loss of
20 coolant. Is it going to happen even? Is there going to
21 be any loss of coolant? If there is, where is it going
22 to happen?

23 So these will be, then, the initial
24 conditions for the accident progression analysis. That
25 is, now that you lost the coolant, it is total or partial.

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1 We didn't know a priori what it was going to be.

2 Then once you get to that situation, out of
3 the accident progress, does the fuel assembly seat that.
4 Do you get the zirconium fire? That was the analysis
5 that Hossein did. So in the structural analysis, we get
6 the loads from the earthquake and then we proceeded to
7 the structural analysis.

8 It very quickly was easy to realize that the
9 intersection of the walls and the floor was where we were
10 going to have the major cracks in the concrete developing
11 and also the largest strains in the liner. So it was very
12 obvious from the results.

13 MS. CURRAN: Well, let me just ask you, one
14 of your assumptions is that you weren't looking at a
15 concurrent reactor accident. So you were just looking
16 at seismic, it sounds like. You decided we'll look just
17 in an earthquake.

18 We're not going to look at a reactor
19 accident. There's nothing here about intentional
20 attacks. So where does it say in here how or why those
21 other causes were ruled out? Where --

22 MS. UHLE: I don't want to cut you off, so
23 if you want to finish your question.

24 MS. CURRAN: Yes. Okay.

25 MS. UHLE: Okay. So let me just try to put

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1 this in context. If you remember the slide, I'm going
2 to be answering your question.

3 MS. CURRAN: Are you a member of the
4 research team. I'm asking --

5 MS. UHLE: I'm the deputy director of the
6 Office of Nuclear Reactor Regulation.

7 MS. CURRAN: Yes. And we're here to
8 question the people who did the research, not the people
9 who are managing the study.

10 MS. UHLE: Well, we all work as a team here
11 at the agency. So this question, the study -- you're
12 exactly right -- the study looked at one specific example
13 of this particular spent fuel pool, what is going to
14 happen under a severe earthquake.

15 And the Office of Research calculated those
16 results. And you're right, exactly right, that partial
17 drain-down was not analyzed in that study.

18 MS. CURRAN: And was that under your
19 direction, that the research people were told we're not
20 going to be looking at partial drain-down. Here's your
21 instructions.

22 MS. UHLE: No, we asked. The Office of
23 Research did a study with the sole purpose of coming up
24 with what they thought would happen at that spent fuel
25 pool, the model spent fuel pool.

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1 But we didn't stop there. That's not how
2 we would make regulatory decisions, because we recognize
3 that this is only one analysis. And this is only one
4 spent fuel pool. And we realize that there are over 100
5 reactors in the United States and over 100 spent fuel
6 pools. And they're all somewhat different.

7 MS. CURRAN: Is there any new research
8 being done or that's going to be done before this decision
9 is made about partial drain-down accidents and how they
10 could occur.

11 MS. UHLE: Well, I can explain how we
12 analyzed partial accidents in our regulatory analysis.
13 We did something very conservative. We recognized early
14 on that partial drain-down is more limiting.

15 Now in the case that was analyzed in the
16 Office of Research, that didn't occur at that postulated
17 spent fuel pool. But we know it could occur under other
18 scenarios.

19 So when we looked to see if there would be
20 a substantial safety increase we assumed, when we looked
21 at the partial drain-down, that 100 percent of the time
22 after the seismic event, 100 percent of the time, that
23 a partial drain-down would cause a release. So
24 when we did that, we didn't bother analyzing the details,
25 because we assumed the most conservative, the largest

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1 impact from a partial drain-down.

2 And when we compared the health and safety
3 effects of that partial drain-down, and 100 percent of
4 the time causing this large release, it does not cross
5 the threshold of a substantial safety increase by
6 precluding that by any regulatory action.

7 MS. CURRAN: So you're saying the most
8 conservative part of the study is in Appendix D, that's
9 where the real conservatism takes place, and that the
10 draft consequence study is an outlier, not the most
11 serious problem.

12 MS. UHLE: I personally wouldn't -- you can
13 look at it that way, perhaps.

14 MS. CURRAN: I think that's what you just
15 told me.

16 MS. UHLE: This is part of our regulatory
17 decision making, that we get a good understanding of, in
18 this case, one such scenario. And then we look to see
19 if we need to continue that detailed analysis or we can
20 make conservative assumptions.

21 And if we can make conservative assumptions
22 that are technically justified, like in this case being
23 the most conservative assuming 100 percent of the time
24 you would get a large release if you have this large
25 earthquake, we showed, in our mind, that by precluding

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1 this partial drain-down we don't cross the threshold for
2 substantial safety improvement according to our
3 regulatory process.

4 MS. CURRAN: I have a question about one
5 more assumption. And that is on Page 23 it says, "For
6 the low density loading situation the high density
7 racking will be used as opposed to low density racking."

8 And the comment about why that assumption
9 was made is that re-racking the pool would represent a
10 significant expense along with additional worker dose
11 and was not felt to be the likely regulatory approach
12 taken based on consultation with the Office of Nuclear
13 Reactor Regulation.

14 Are there any data that were used there?
15 There's no reference to any documents. I'm just curious
16 how that was, on what basis that -- I would like to ask
17 the researchers to speak first. And then if NRR has
18 additional comments, would you please --

19 MS. UHLE: We are all on a team here. So
20 sometimes the questions, one person may have more
21 knowledge in a particular area. And you may think
22 research should answer.

23 But the way we approach it is we coordinate
24 very closely so there is really no demarcation between
25 the Office of Research and the Office of Nuclear Reactor

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1 Regulation.

2 MS. CURRAN: You seem to know more about
3 this study than the people who did the research. Is that
4 the case?

5 MS. UHLE: The regulatory analysis part was
6 done by the Office of Nuclear Reactor Regulation. And
7 as the deputy director, I'm very familiar with the
8 regulatory analysis piece. So it depends on your
9 question.

10 MS. CURRAN: Well, where's the
11 documentation for this assumption?

12 MS. UHLE: On the fact of the -- I'm sorry,
13 if you could repeat your question.

14 MS. CURRAN: The high density racking was
15 really, when the study talks about low density racking
16 it really is referring to high density racking. And that
17 was a decision that was made based on consultation with
18 the Office of Nuclear Reactor Regulation.

19 MR. JONES: This is Steve Jones. And I'm
20 in the Office of Nuclear Reactor Regulation. We did have
21 working level meetings in development of this study
22 between research and all the other offices that have
23 relevant input.

24 And one of them was looking at how the fuel
25 is stored, what the characteristics of the fuel are. And

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1 in particular, for the BWR fuel, it is in a channel box
2 during reactor operation.

3 And those typically are not removed for fuel
4 storage. So those, in fact, constrain any crossflow
5 benefit that would be obtained by changing out the racks
6 into some design that would allow crossflow and would
7 have to be in a lower density configuration.

8 And also, there's also modeling impacts as
9 far as determining if you change out the rack design you
10 have to look at different flow patterns and things that
11 may not be as well supported by the experimental stage.
12 I'd have to defer to research on that aspect.

13 MS. CURRAN: Does the Office of Research
14 have a comment on that?

15 MR. ESMAILI: Yes. I was just going to
16 extend that. We think that with the channel boxes you
17 are going to impede the crossflow. But in the case of
18 this SFPS it doesn't really matter that much, because we
19 show that during the first two months that is based on
20 the damage state to the pool during the first two months,
21 that we do get the zirconium fire.

22 Even though you establish a natural
23 circulation, the fuel is still hot enough that causes a
24 zirconium fire. After that time, you are not going to
25 get any zirconium fire anyway.

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1 So the fact that we did not look at an open
2 frame is not going to change the overall conclusions of
3 our analysis. In other words, we can speculate about
4 this three-dimensional natural circulation pattern that
5 could happen.

6 The fact is that in natural circulation a
7 pattern did develop in some of the cases that involved
8 them moderately. And the fuel still was hot enough to
9 cause a zirconium fire during the first two months.

10 We do document all of those analysis that
11 show that you are potentially getting zirconium fire and
12 very large releases. But after that time, even with the
13 racks in place, even with the channel boxes in place, we
14 do not get any zirconium fire and any releases.

15 MS. CURRAN: So you did do an analysis of
16 fire risk in open frame pools. Is that in the study?

17 MR. RAKOVAN: And if we could try to wrap
18 up this discussion. It's all we can --

19 MS. CURRAN: I'm just finishing this one --

20 MR. RAKOVAN: Understand.

21 MS. CURRAN: -- and I'll be done.

22 MR. RAKOVAN: Just --

23 MS. CURRAN: I just want to understand. I
24 don't --

25 MR. ESMAILI: My point is that we did not.

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1 MR. SHERON: Yes, we did not assume that the
2 channel boxes were removed from the BWR fuel so that there
3 was an open crossflow of air available.

4 MS. CURRAN: But it sounded, from what you
5 were saying, as though you did some analysis, if you had.

6 MR. ESMAILI: No. I did not say that. I
7 said even with everything in place -- see one of the cases
8 that we have, you empty the pool in about six hours. So
9 you establish a natural circulation to the pool.

10 Still, you get zirconium fire by about 15
11 hours or so. So that means that even there is natural
12 circulation, the fuel is hot enough that it can go to a
13 zirconium fire and potential releases.

14 So this is the point. So any additional
15 benefit of air cooling is not going to help you much.
16 Because you already have established a natural
17 circulation pattern.

18 MS. CURRAN: Right. And that's assuming
19 the channel boxes are still in place, right?

20 MR. ESMAILI: Channel boxes are still in
21 place. That would help, actually. That would be a more
22 coherent one-dimensional flow to the assemblies.

23 MS. CURRAN: Oh, and isn't it possible to
24 remove the channel boxes?

25 MR. ESMAILI: Yes, it is possible. Yes.

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1 MS. CURRAN: But you didn't look at that?

2 MR. ESMAILI: No. What I'm saying is that
3 it didn't matter that much. Because we did establish a
4 natural circulation pattern, even with the channel
5 boxes, even with the rack cells in place. And we still
6 got a zirconium fire during the first two months.

7 When you go past two months, even with the
8 channel boxes in there, even with the rack cells in there,
9 you do not get to a zirconium fire. This is because of
10 the damage state to the pool that results in either a very
11 rapid drain-down or a very, very slow drain-down.

12 I just want to clear one point about this
13 partial drain-down. One of the scenarios that came out
14 was a small leak. In the case of a small leak, it could
15 potentially be even worse than a partial drain-down.
16 The results are in the report for the people who want to
17 look at the details of the results.

18 And this is because you go through, during
19 this small leakage, you go to steam oxidation. It's by
20 far less energetic than an air oxidation. So you do heat
21 up the fuel.

22 At some point during this small leakage, the
23 base plate clears. And once the base plate clears, once
24 the water level goes down, then you have a rush of air.

25 MS. CURRAN: Right. And wasn't that in 72

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1 hours, within 72 hours?

2 MR. ESMAILI: Before 72 hours.

3 MS. CURRAN: Before. So it wasn't a
4 prolonged period. It was --

5 MR. ESMAILI: So you get the releases
6 before 72 hours. But the point I'm trying to make is that
7 you've already got the fuel hot enough. Once you bring
8 the air in, you're not going to be able to cool it. You
9 are going to actually make the matter worse. You are going
10 to have a huge release.

11 I think we have enough figures in the report
12 to show that -- and it goes through a steam oxidation,
13 which is representative of a partial LOCA followed by a
14 rush of air -- things go south. And you get large
15 releases, you initiate a zirconium fire.

16 This is because the interaction with air is
17 much, much more intense than interaction with steam. So
18 the small leak scenario actually could potentially have
19 higher releases than had the accident progressed without
20 having a late ingress of air.

21 Having said that, the partial drain-down,
22 which is not what we predicted in this study, because we
23 did a detailed analysis, if you do a partial drain-down,
24 you could change the coolability.

25 Right now we are expecting that we have,

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1 after about two months or so, the fuel is cool enough so
2 that when air comes in it's going to cool it. That's
3 because you get air in there.

4 But if the air is partially blocking it,
5 then you are not going to get that cooling later on. But
6 the releases are going to be much less than if the air
7 comes in. The air is, and sometimes it is worse because
8 the oxidation that has taken place in steam is going to
9 make it worse.

10 So we have looked at scenarios that
11 approaches what a partial drain-down looks like. And it
12 can be even worse than that.

13 MS. CURRAN: Okay, thank you.

14 MR. ESMAILI: Yes.

15 MR. RAKOVAN: All right. Ms. Curran, you
16 had some associates that wanted some time at the
17 microphone as well?

18 MS. CURRAN: Yes.

19 MR. RAKOVAN: And if I could ask the NRC
20 staff, before you speak, if you could identify
21 yourselves. We do have a number of people who are
22 participating by various technologies where they can't
23 see you or maybe they don't know who you are. So if you
24 would introduce yourselves each time you begin a
25 conversation or answer a question, I'd appreciate it.

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1 Please.

2 MR. LOCHBAUM: My name is David Lochbaum.
3 I'm with the Union of Concerned Scientists. Prior to the
4 NUREG-1738 study, there was an email dated September
5 19th, 2000, from somebody in the Office of Research that
6 transmitted a report that was done for that study by NRC
7 consultant Robert Kennedy, titled Response to Questions
8 Concerning Spent Fuel Pool Seismic-Induced Failure Modes
9 and Locations and Expected Level of Collateral Damage.

10 I want to read a couple of quotes from that
11 consultant's study and then ask a question. The
12 consultant wrote, "The critical failure mode for the
13 gross structural failure of the pools is an out of plane
14 shear failure of the pool floor slab.

15 "With this failure mode, the liner will be
16 breached and a large crack will develop through the
17 concrete floor slab within a distance equal to the floor
18 slab thickness from the pool walls."

19 Later in that report he writes, "My judgment
20 is that for BWR pools it is as least equally likely that
21 the critical failure mode will be an out of plane shear
22 failure of one or more of the pool walls.

23 "With this failure mode, the liner will be
24 breached and a major concrete crack will form along the
25 length of the wall from a wall thickness distance from

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1 the top of the floor slab. Water will quickly drain out
2 of the pool, however as much as four feet of water depth
3 will likely remain within the pool."

4 He says later, "I believe that either of
5 these two shield failure modes reported above for BWR
6 would also be the critical failure mode for some PWR
7 pools."

8 There's also an email that was released by
9 FOIA dated August 29th, 2000 -- and I'll email this
10 material to Mr. Witt so you get the email numbers and all
11 that so you don't have to write it down -- from Goutam
12 Bagchi of the NRC's Office of Nuclear Reactor Regulation
13 that says -- and he was addressing the point of if you
14 have such a large earthquake, what other collateral
15 damage might occur by that same magnitude earthquake.

16 And he wrote, "Based on discussions with
17 staff structural engineers, there was a high likelihood
18 that there will be building damage that leads to blockage
19 of air flow. For heavy load drop consequences, the staff
20 assumed a 50 percent partition to the high flow case."

21 He goes on later to repeat what the
22 consultant Kennedy said saying, "Failure of the spent
23 fuel pool walls due to earthquakes is predicted to occur
24 due to shield failure of the side walls. The critical
25 shear plane is at a distance equal to the thickness of

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1 the wall."

2 Were the authors of the draft study aware
3 of these prior NRC staff and consultant reports on the
4 likely location of the pool failure?

5 MR. PIRES: Yes, certainly. We reviewed
6 those reports. Those are appendices to NUREG-1738. We
7 reviewed them very carefully. And the analogy that we
8 did for our spent fuel pool very clearly indicated that
9 shear failure mode on the walls did not develop.

10 Indeed, that makes sense too, as why the
11 walls are pretty much same thickness as the floor. And
12 the loads are smaller on the walls, because the floor
13 carries all the gravity loads. All the self weight is
14 higher on the floor. So it's pushed down more.

15 And it turns out that when you have a 90
16 degree angle you have a vertical wall and a horizontal
17 floor. And you have pressure of both sides. What you
18 attempt to do is open that angle.

19 In this case, the critical location was a
20 reflection of failure at the bottom of the wall. It was
21 very obvious from the results of the analysis.

22 In some other structures, for instance in
23 the pressurized water reactors where you can have the
24 slab on the ground, it's sitting on the ground, then it's
25 not pushed down as much as in the BWR.

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1 In that case, the shear failure on the wall
2 is more likely. And so that's why, in the regulatory
3 analogies, we provided the input that they should
4 consider a partial drain-down in that case, even though
5 there are simply BWRs in which the failure may also be
6 at the bottom of the walls.

7 But the information we provided to the
8 regulatory analysis was it would be prudent, in that
9 case, to consider it as a partial drain-down and proceed
10 according to that assumption.

11 MR. RAKOVAN: Jose, if you could remember
12 to introduce yourself, please.

13 MR. PIRES: I'm sorry. I was Jose Pires
14 from the Office of Research.

15 MR. LOCHBAUM: Just a follow-up question.
16 You said it was obvious that the pool failure would be
17 at the --

18 MR. PIRES: In this case, yes.

19 MR. LOCHBAUM: Just curious, I know since
20 you weren't involved in that, but why wasn't it obvious
21 ten years ago when those NRC staff and consultant looked
22 at it then? Has it become obvious in the last decade?
23 Or was it well hidden back in those days?

24 MR. PIRES: He probably did not get as much
25 information as we had or probably was thinking about some

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1 other pool dimensions of the walls and the reinforcement.
2 He might not have done an analysis as careful as we did.

3 I'm not excluding that there may not be a
4 pool there in which the walls would be sufficiently thin
5 for that to happen. But in this case the walls and the
6 floor are both equally thick. And the floor has far more
7 load.

8 MR. LOCHBAUM: I guess a follow-up would
9 then be, so there's no chance there'll be something
10 obvious ten years from now that's hidden now based on new
11 information or the same thing that led to this iteration
12 or evolution of what we think is going to happen.

13 So we got it perfectly right now. And
14 there's no possible chance that it's going to be refined
15 in the future. Is that where we're at today?

16 MR. PIRES: Do you want to answer that?

17 MS. UHLE: Well again, this was one
18 analysis that was done for this one spent fuel pool in
19 a regulatory analysis that then broadens out the
20 applicability of some of the results.

21 We made very, again, conservative
22 assumptions with regard to partial drain-down. And, of
23 course, that is directly affected by the location of the
24 breach in the liner.

25 And what we did is we assumed that in a

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1 partial drain-down situation -- as if the hole, the
2 breach, was higher up as you're, I think, pointing out,
3 the consultant back in 2000 had suggested -- we assumed
4 that the probability of the release was 100 percent.

5 And so the probability was that after the
6 seismic event of a large magnitude that we would get, 100
7 percent of the time, what we would say just a complete
8 release of the inventory. So we felt that we have
9 bounded the situation.

10 Now part of our reg process, and I know
11 you're very aware, is that we are constantly evaluating
12 to make sure that our regulatory positions remain sound
13 in light of new information.

14 We have a very robust research program. We
15 look at operating experience domestically,
16 internationally. And we constantly evaluate whether or
17 not there is new information that we should analyze and
18 go back and look to see if our regulations are
19 appropriate.

20 So I agree that things may change in ten
21 years, I don't know in which direction but as far as our
22 understanding, and we'll be there to take a look at it.

23 MR. LOCHBAUM: Was the office of the draft
24 study aware of this collateral damage to the building
25 that might block water or airflow to the pool? Or did

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1 you only look at the damage to the pool and the water
2 drainage effects resulting from that.

3 Because in the earlier study, there was
4 concern that an earthquake of that magnitude caused the
5 building around the pool to suffer some damage as well.

6 MR. PIRES: Right. We read very carefully
7 that appendix and the author of the NUREG-1738 and that
8 led for us to consider those possibilities.

9 And for instance, in the case of the Peach
10 Bottom Nuclear Power Plant, this plant was analyzed very
11 carefully during the NUREG-1150 study. So there was a
12 probabilistic risk assessment done for the plant.

13 And they provided fragility functions for
14 the reactor building there. And the median fragility of
15 the reactor building was higher than the median fragility
16 for the pool. So we felt confident that we will not have
17 damage from the reactor building that would cause
18 blockage of the airflow in this case.

19 Also the roof of the reactor building for
20 these reactors isn't very likely to -- so it's not the
21 type of structure that is likely to fail during an
22 earthquake.

23 It's also the columns are off that, and the
24 truss beams on the roof are very strong because it's also
25 a crane bay. The columns are rated for a 120 ton crane.

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1 So it's an unlikely situation that will collapse by the
2 seismic event.

3 MR. LOCHBAUM: Okay. I appreciate it. So
4 you did consider in the ways that you just described.

5 MR. PIRES: Well, we considered, we
6 provided thought on that, yes.

7 MR. LOCHBAUM: Okay. I appreciate that.
8 Thank you.

9 Turning to a different topic, a related
10 topic, we're concerned about -- we advocate accelerating
11 a transfer from pools to dry cask, not only for this
12 imaginary earthquake, but also for the more realistic
13 criticality concerns that could occur. We
14 think that thinning out the pools restores geometry as
15 a criticality barrier. And that was basically totally
16 neglected from the study.

17 There's a June 21st, 2010, letter from the
18 NRC to the Turkey Point licensee where a \$70,000 civil
19 penalty was imposed for, "The finding involved the
20 failure to properly manage known degradation of
21 Boraflex, a neutron absorber material used in the Turkey
22 Point Unit 3 spent fuel pool."

23 Later in the same letter, the NRC concluded
24 that licensee's data are insignificant to support the
25 conclusion that when accounting for identified

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1 degradation of Boraflex panels in the Turkey Point Unit
2 3 spent fuel pool storage racks. In effect, would have
3 been maintained less than 1.0 for all cases when flooded
4 with unborated water as required by -- and it's cited as
5 a technical specification.

6 More recently, just last month, August
7 22nd, 2013, the NRC issued a letter to the Comanche Peak
8 licensee involving the proposed removal of over 200 fuel
9 assemblies from the Unit 1 and Unit 2 spent fuel pools
10 to address criticality concerns where they had also
11 messed up the administrative protections against
12 criticality.

13 And unloading the spent fuel pool into dry
14 cask was the way to restore the necessary criticality
15 protection margins.

16 Attached to that letter was a June 13th,
17 2000, letter from the licensee that committed to that
18 plan that said, "Nine dry cask canisters will be loaded
19 during the campaign (288 fuel assemblies)."

20 Fuel assemblies loaded into the cask will
21 be chosen from the candidate list of assemblies currently
22 residing in the spent fuel pool. The vast majority of the
23 fuel will be loaded from Region 2 locations.

24 The reason it's so complex dates back to an
25 NRC interim staff guidance, DSS-ISG-2010-01 regarding

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1 spent fuel pool criticality safety. If you'll indulge
2 me, I'll read a section from that as well.

3 "Increasing the storage capacity in the
4 existing SFP was the first step in increasing onsite
5 storage capacity. Licensees transitioned from low
6 density storage relying on flux traps caused by the large
7 center-to-center spacing of the fuel assemblies to high
8 density storage relying on installed neutron absorbers
9 to accommodate the reduced center-to-center spacing of
10 the fuel assemblies.

11 "However, virtually every permanently
12 installed neutron absorber for which a history can be
13 established has degraded in the SFP environment."

14 So were the authors of the draft study aware
15 of these and several other spent fuel pool criticality
16 margin issues?

17 MS. UHLE: Thanks, this is Jennifer Uhle
18 from NRR. Yes, the study did not look particularly at
19 the criticality concern. The way we're dealing with the
20 criticality concern in NRR, in the Office of Nuclear
21 Reactor Regulation, is to increase our attention and
22 focus in communication with the licensees.

23 There cases where there were licensees, as
24 you're very well pointing out, that we issued violations
25 to. Now, when we issue a violation that does not mean

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1 that the plant is not safe.

2 Our regulatory requirements that you had
3 pointed to with K-Effective being less than one with
4 unborated water flooding up, that's a very conservative
5 regulatory limit.

6 So just because there are violations does
7 not mean that the plants are getting anywhere near where
8 adequate protection is not provided from a criticality
9 perspective.

10 But we do realize BORALL and Boraflex are
11 degrading. We have taken regulatory action and we
12 continue to focus on that to ensure that there is
13 criticality control in the spent fuel pools.

14 MR. LOCHBAUM: Wouldn't a legitimate
15 hazard concern consider all hazards rather than just one?
16 I mean, if you were looking at relative benefits of pool
17 storage versus dry cask storage, you look at all hazards.

18 You wouldn't just throw out the ones and
19 select one that gives you the answer you want if you were
20 doing a good job, a responsible job. But that's a
21 rhetorical question.

22 MR. SHERON: David, I think you have to keep
23 in mind that we looked at this from a risk standpoint.
24 And we also looked at it from a cost/benefit.

25 And while, yes, a criticality problem can

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1 lead to fines and stuff, does it really lead to a very
2 high risk situation? And when you look at the PRAs and
3 the like, I don't think that rises up at least to the level
4 where the seismic event did.

5 MR. LOCHBAUM: But if you're looking at it
6 from a cost/benefit standpoint, you could look at the
7 cost of unloading the fuel and restoring geometry versus
8 the cost of all the measures that you do to ensure that
9 the neutron absorbers are there, all the surveillances,
10 all the things.

11 So if you forget the risk, as you apparently
12 have done, and only look at the cost, it looks like it's
13 more prudent financially to do the transfer to dry cask.
14 And therefore you don't have to spend all the money in
15 putting in the neutron absorbers and in checking them
16 every so often to make sure they're good.

17 MS. UHLE: Again, I would point to the fact
18 that we feel our regulatory approach is very robust. But
19 we do recognize that if the actual physical separation
20 does promote more conservatism in the criticality
21 concern -- upon hearing your view -- I think in our
22 regulatory documents that we will be providing to the
23 Commission we will write down a more specific reason why
24 we feel that the fact that we did not consider criticality
25 is appropriate.

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1 MR. LOCHBAUM: Okay.

2 MR. RAKOVAN: Just one last question,
3 David.

4 MR. LOCHBAUM: I'd like to be back in the
5 queue then, because I didn't get through all of them.

6 MR. RAKOVAN: Okay, understand.

7 MR. LOCHBAUM: But just one last question.

8 MR. RAKOVAN: I'll put you back.

9 MR. LOCHBAUM: I thought my time was my
10 time, not the filibuster time. But that's why I was
11 shooting for the ten minutes. But we'll try.

12 ML-13197(a)051 is a March 16th, 2011,
13 letter written by the NRC Ops Center during the Fukushima
14 crisis. Attached is a one page table titled, "Fukushima
15 Daiichi Summary Display."

16 It showed the priorities for the six
17 reactors at Fukushima Daiichi. Unit 4 was the NRC's
18 Number 1 priority, because, "Core offloaded to spent fuel
19 pool, secondary containment destroyed. Walls of SFP has
20 collapsed. Spent fuel pool liner is intact. No SFP
21 cooling at this time. Working on adding water by hose
22 spray."

23 It's more than 72 hours after the earthquake
24 and tsunami. Yet it's ahead of three reactors that the
25 NRC thought had suffered severe core damage, had

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1 secondary containment failures. So a spent fuel pool 72
2 hours later, more than 72 hours later, was the NRC's top
3 priority.

4 And other emails said that was the
5 recommendation to the Japanese, to put water back in the
6 pool. Air cooling was good enough after 72 hours. The
7 Number 1 priority after 72 hours was a spent fuel pool,
8 not three damaged reactor cores with secondary
9 containment gone. How is that possible?

10 MS. UHLE: Let me just double-check. This
11 is Jennifer Uhle from NRR. So is the question of why we
12 felt that the spent fuel pool Number 4 was the highest
13 priority 72 hours after the initiating event?

14 MR. LOCHBAUM: No. I think that was the
15 correct assessment. The assessment is how now can you
16 dismiss -- you have a mission time of 72 hours. Nothing
17 bad can happen after 72 hours. If you were applying
18 these rules, your study for the situation, the Unit 4
19 spent fuel pool would not be an issue after 72 hours.

20 MR. SHERON: I don't think we've said that
21 nothing bad happens after 72 hours.

22 MR. LOCHBAUM: You stopped looking at 72
23 hours. The mission time is 72 hours. You don't really
24 look beyond 72 hours.

25 MR. SHERON: That was after two months. In

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1 other words, we said that after two months that the fuel
2 was in the pool that you had at least 72 hours and possibly
3 more time for operators to take any kind of action to put
4 water in the pool. But that was two months later. At
5 Fukushima, I believe, this fuel had just been recently
6 offloaded.

7 MR. LOCHBAUM: Four months ago.

8 MR. SHERON: Huh?

9 MR. LOCHBAUM: Four months earlier.
10 December of 2010.

11 MR. JONES: Well, I think what you're
12 getting at is we had some uncertainty about the status
13 of the pool at Unit 4, because there was a hydrogen
14 explosion. And not necessarily understanding where
15 that hydrogen came from, one possible place to jump to
16 is steam oxidation of the fuel in the spent fuel pool.

17 However, the conditions of that fuel as
18 you're getting at it with four month decay did not really
19 readily support that. However, it's hard to explain
20 that.

21 That's why we were looking at the Tier 1
22 activities for instrumentation to monitor level in the
23 spent fuel pool, and the associated water that we've
24 issued, to understand the conditions of the spent fuel
25 pool.

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1 Nevertheless, as we explained earlier in
2 the meeting, there was no damage to the fuel, the water.
3 Inventory in those pools was only lost by evaporation.
4 And there was adequate time to recover that inventory
5 later in the event. I guess that's all I really had to
6 address your question.

7 MS. UHLE: Okay. That was what I was going
8 to say. And what contributed to our concern -- this is
9 Jennifer Uhle from NRR -- what contributed to our concern
10 was exactly that, the uncertainty.

11 It was 72 hours. We weren't getting a lot
12 of information from Japan. We saw that there was the
13 hydrogen detonation. That leads one to think that there
14 is obviously oxidation occurring.

15 And as it turned out, as Steve said, there
16 was no uncovering. The hydrogen, as it's currently
17 thought, was actually migrating from Reactor 3 standby
18 gas treatment system. And it flowed into the reactor
19 building for Number 4. So there was no damage to the
20 spent fuel pool.

21 But because of the hydrogen detonation,
22 even though it was very confusing to us, we felt the
23 conservative action would be to put water in there, until
24 we then determined later that there was no damage.

25 MR. LOCHBAUM: Very convenient hydrogen

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1 explosions, because they provided the pathways for that
2 water addition. I'm glad my time is up. My voice is
3 gone. Thank you.

4 MR. RAKOVAN: Well, we'll see if you can get
5 it back and we'll bring you back up, okay. Okay, for our
6 next speakers, I would like to go to Robert Alvarez, then
7 Gordon Thompson and then Ed Lyman. Mr. Alvarez?

8 MR. ALVAREZ: Good morning. I'll be brief
9 since several issues have already been covered and I
10 don't feel like we should be running over the squirrel
11 over and over.

12 What I will discuss and ask is, in looking
13 at your study, I came to the conclusion that you did not
14 look at multiple risk factors in terms of a concurrent
15 impacts on a reactor.

16 And it's been well known, if you just take
17 a little bit of a dive into NRC sponsored research of '85,
18 '90, specifically at this reactor in terms of beyond
19 design basis events, that these studies actually
20 predicted quite accurately what happened at Fukushima,
21 especially the discharge and accumulation of large
22 amounts of explosive hydrogen in the fuel bays that cause
23 really severe destruction of the entire spent fuel
24 infrastructures, including the collapse of the cranes
25 into one of the pools.

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1 And so I'm curious why you didn't look at
2 these multiple risk factors. Because to me it looks
3 like, having worked on the Hill and having to explain this
4 to members of Congress, it looks like you've done this
5 sort of study in a vacuum that excludes all the other
6 variables that would impact the spent fuel pool,
7 especially when you take a look at the aftermath.

8 Let's assume we haven't had a large release
9 that didn't occur at Fukushima in Pool 4. It is turning
10 into quite a daunting task to come to terms with even
11 physically removing this material right now. And so why
12 didn't you look at that?

13 MR. ESMAILI: Yes. We did look at, during
14 the outage when the reactor and the spent fuel pool are
15 connected, we did look at the decay heat from the reactor,
16 as long as they were thermohydraulically connected.

17 But the study was focused on the consequence
18 of the spent fuel pool itself. So we wanted to know
19 what's the difference between a high density and low
20 density. We do have some --

21 MR. ALVAREZ: Doesn't this violate, say,
22 basic principles of systems engineering?

23 MS. UHLE: Again, the study was a certain
24 scope. And we recognized the limitation of the scope of
25 the spent fuel pool study done in research. So in a

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1 regulatory analysis, we made conservative assumptions to
2 bound what that effect would be.

3 And for example, we recognized that there
4 could be a reactor accident occurring at the same time
5 as a spent fuel pool accident. And that would take
6 operator attention away from any mitigating strategies
7 possible in the spent fuel pool.

8 So what we assumed conservatively, to make
9 the low density loading more safety beneficial than the
10 high density loading, we assumed that the mitigation
11 strategies will be 100 percent effective for the low
12 density loading.

13 And then we assumed that the high density
14 loading, all the mitigation strategies would not be
15 effective. So we feel that we, again, did a conservative
16 assumption to bound this influence of the state of the
17 reactor and the attention drawn away from the spent fuel
18 pool.

19 MR. ALVAREZ: As you know, the spent fuel
20 pool is really a system. It involves refueling
21 cavities, membranes, transfer equipment, et cetera.
22 Did you consider the possibility of a full core offload
23 in a refueling cavity?

24 MR. ESMAILI: We did not look at full core
25 offload because, as we stated in one of the assumptions,

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1 this is not typical. As far as --

2 MR. ALVAREZ: I understand that. But
3 having worked in this industry for 40 years, one thing
4 about the nuclear enterprise is that it's a surprise when
5 there are no surprises.

6 MR. ESMAILI: Right. So because the study
7 was supposed to be a best estimate -- and so we were not
8 looking at all the conditions, all the bounding
9 conditions -- we were looking at a best estimate of how
10 the accident progresses.

11 MR. ALVAREZ: But you do have a relatively
12 high frequency of usage of these systems. And I'm not
13 saying that it's always a full core offload there, it's
14 certainly at least one third of the core going into these
15 refueling cavities at any given time. And you did not
16 look at the impact of that, of an earthquake impacting,
17 let's say, one third of the core during a refueling?

18 MR. ESMAILI: As the fuel is being removed
19 to the spent fuel pool?

20 MR. ALVAREZ: Yes. In the refueling
21 cavity?

22 MR. JONES: All right. This is Steve
23 Jones. Yes, the study implicitly assumed that there was
24 fuel movement into the spent fuel pool. There's no fuel
25 that remains in the cavity, per se.

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1 MR. ALVAREZ: What if it is in the reactor?

2 MR. JONES: It's either in the reactor,
3 there's one assembly in transit. And then it's placed
4 in the storage location in the spent fuel pool during a
5 typical refueling and --

6 MR. ALVAREZ: Okay. Well, you've answered
7 my question. The other issue I'm curious about is age
8 and deterioration of the pools.

9 When I read your study, you have two
10 citations. One is a NEI study about an aircraft impact
11 into a pool. And the other is a 1989 study. And I'm
12 aware at least of a 2001 study that the NRC sponsored by
13 Oak Ridge which I'll just quote.

14 It says, "As nuclear plants age,
15 degradations of spent fuel pools, reactor refueling
16 cavities, are incurring at an increasing rate primarily
17 due to environmental related factors. During the last
18 decade, a number of nuclear power plants have experienced
19 water leakage from spent fuel pools and reactor fueling
20 cavities."

21 The authors of the study also indicate that
22 accurate assessment of aging of spent fuel pools is
23 uncertain. Because, "It's often hard to assess what's
24 going on underground," in essence.

25 Instead, I found it curious that you point

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1 to a study that was 24 years ago when none of these effects
2 were being observed, at least in looking at your
3 references. And how do you come to terms with that? How
4 do you reconcile that?

5 MR. PIRES: We did not explicitly account
6 for degradation effects of the material. The NRC does
7 keep informed on those studies on degradations of
8 materials in the pools. And just recently, there was a
9 report published.

10 But we did sensitivity analysis. We
11 considered, we varied properties of the concrete, we also
12 varied the properties of the limiting strains in the
13 liner. We assumed conservative limiting strains in the
14 liner.

15 We noticed that, for the most part, wave
16 augments in the liner tend to be away from the
17 discontinuities in the pool where you have cross sections
18 between walls. So these areas of low strength.

19 Also, when we looked into detail at the
20 liner, it turns out that it's very complex component. At
21 the end of the liner there are drainage channels. And
22 these drainage channels try to collect water that might
23 leak through the liner on a regular basis to limit the
24 amount of water that leaks to the concrete.

25 And that water is collected by these drainage

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1 channels. And it's normally a very small amount of
2 water. It's usually less than water lost by evaporation
3 in a day. So even though it was not explicitly accounted
4 for, we did sensitivity analysis to account for material
5 properties --

6 MR. ALVAREZ: Do you think that the
7 deterioration that goes undetected can bring about a
8 non-linear event?

9 MR. JONES: This is --

10 MR. PIRES: Yes, go ahead.

11 MR. JONES: This is Steve Jones. I just
12 wanted to clarify. The operating experience we've had
13 so far has been very minor leakage in a variety of
14 locations in a select number of nuclear power plants.

15 And it's been on the order of tens to
16 hundreds of gallons per day, nothing that would even
17 approach threatening the ability to maintain inventory
18 in the pool. And the normal status is there is no
19 leakage. And these channels monitor that on a regular
20 basis.

21 MR. ALVAREZ: Now, just to add a little bit
22 to the point that Dave Lochbaum raised, this same study,
23 this 2001 study, also noted that borated water enhances
24 the degradation of concrete.

25 So there's quite a bit of mitigation going

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1 on because of deterioration of neutron absorbing panels
2 by compensating by adding more boron to the water in some
3 cases, San Onofre being one. I'm not familiar with all
4 the reactors out there. But these are also factors that
5 I just wanted to mention. And finally --

6 MS. UHLE: Can I just add to that? I think
7 that the answer that Jose provided, that we did vary the
8 properties, the structural properties in both the liner
9 and the concrete account for the reductions, as I think
10 you're trying to lead us to, in any of the material
11 properties due to aging.

12 MR. ALVAREZ: I have one more question and
13 I'll be gone. Why didn't you compare the hazards of high
14 density pool storage with dry cask storage, the relative
15 hazards?

16 Because at least, in terms of your emergency
17 preparedness and planning, I'm referring to NUREG-1889
18 where you're using -- it's the RASCAL model. And you use
19 the RASCAL model, and a lot of it's done for, thank
20 goodness, for test out purposes, not for real world
21 purposes.

22 But the underlying assumptions in that
23 particular report seem to come from the '87 Brookhaven
24 study in terms of release fractions and things like that.
25 But it does note that your releases, if someone were to

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1 put a shaped charge on a dry cask, it would release about
2 2500 times less radioactivity than a pool fire.

3 That is a tremendous difference in
4 consequences. And so why didn't you look at that? I
5 mean, the other issue is just take a look at the Fukushima
6 site. You had 408 assemblies and nine dry casks, which
7 were unscathed.

8 MS. UHLE: The way we handled this is, of
9 course, the fuel needs to be aged to a certain point and
10 decay heat load dropped, as you know, before it goes into
11 a cask.

12 And what we did is we assumed that there was
13 no risk posed by the casks. And we compared it to the
14 risks posed by a fully loaded pool. And again, the delta
15 between that, which would then equate to the safety
16 increase, was not enough in our regulatory process to
17 warrant regulatory action.

18 MR. ALVAREZ: And this includes your
19 increased source terms due to high burnup and the like.

20 MS. UHLE: Yes, yes.

21 MR. ALVAREZ: All right. Thank you very
22 much.

23 MR. JONES: This is Steve Jones. I did
24 just want to point out that the spent fuel pool study does
25 include, in Chapter 10, a comparison of relative

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1 consequences between pools and dry casks that may help
2 answer your question.

3 MR. ALVAREZ: Thank you.

4 MR. RAKOVAN: Okay, Roy. I think we'd like
5 to go next to Gordon Thompson, who I believe is on the
6 phone.

7 (Pause)

8 MR. RAKOVAN: Roy, are you there?

9 OPERATOR: This is the conference
10 coordinator. Please press Star 1 to have your line
11 opened.

12 MR. THOMPSON: Hello.

13 OPERATOR: Thank you. Your line is open.

14 MR. RAKOVAN: Go ahead, sir. We're ready.

15 MR. THOMPSON: Can you hear me? This is
16 Gordon Thompson.

17 MR. RAKOVAN: Yes, we can. Please go
18 ahead, Mr. Thompson.

19 MR. THOMPSON: Thank you. I've prepared a
20 comment on the study that we're discussing that was
21 submitted early August. And I don't propose to go over
22 that in detail, because it stands for itself. But I'll
23 touch on a number of points briefly.

24 In summary, I concluded that the drop study
25 was both misleading and incomplete. And I'm sad to hear

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1 that the NRC staff continues to make misleading
2 statements, which they did in the opening presentations
3 for this meeting today.

4 I wish the staff would stop pretending that
5 they have examined a low density fuel storage case in the
6 pool. They have not, and they should be forthright and
7 honest about what they have and have not done.

8 Now, another point I make in my commentary
9 is that the staff has constructed a superstructure of
10 analysis including regulatory analysis based upon a very
11 weak foundation of basic understanding of the phenomena
12 of a pool fire.

13 The potential for a pool fire has been known
14 since at least 1979. So the NRC has had a period of 34
15 years during which it could have established a thorough
16 understanding of the phenomena of a pool fire. It has
17 not done so despite many calls for this from public
18 interest groups, state and local governments.

19 It's essential to establish a solid science
20 based understanding before considering the event
21 sequences that could cause water loss or presence of
22 debris.

23 Only by acquiring a really thorough
24 understanding of the events that could lead to a pool fire
25 can one establish the intellectual base to be certain

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1 that you can then look at events that might lead to that
2 outcome.

3 Now, early on people thought about pool
4 fires and said, gee, the decay heat is very low. How can
5 this be a problem? But as soon as you look at this
6 problem you realize that the nature of a high density
7 closed form rack is such that heat transfer is very
8 feeble, especially when there's flow blockage from
9 residual water or debris.

10 And therefore, you need a very careful
11 analysis backed up by experiment to determine whether
12 your highest decay heat fuel can reach the ignition
13 point. You need further very careful analysis to see how
14 that fire propagates within the first effected assembly
15 and to other assemblies.

16 This work has simply never been done
17 properly. In this instance, the staff has taken the
18 MELCOR code, which was written for other purposes, and
19 has adapted it without providing a thorough explanation
20 of how they've done this adaptation or what experimental
21 validation they have for it.

22 The staff has admitted in its own report
23 that the MELCOR code uses a very crude process of modeling
24 radiating heat transfer, which we know is a crucial
25 phenomena in determining the heat-up of fuel,

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1 particularly in the event of flow blockage.

2 The staff also concedes that MELCOR has no
3 capability to examine clad ballooning or rupture
4 phenomena which can affect fuel heat-up and ignition.

5 So my recommendation is that this study be
6 scrapped completely and that the NRC go back to basics,
7 start with a clean slate and develop a really solid
8 understanding of the phenomena accompanying a pool fire.

9 I have laid out in my comments of August 5th
10 briefly how that could be done. And in doing so, the
11 staff would need to address, among other issues, those
12 raised by the ACRS in a letter to the NRC Chair of April
13 13th, 2000.

14 And a number of significant phenomena were
15 identified in that letter report pertaining to the
16 phenomena of pool fires. I'll touch on them briefly.

17 First, there was high burnup fuel, there can
18 be a presence of zirconium hydrides that could lead to
19 spontaneous combustion of ignition in air, spontaneous
20 combustion of zirconium cladding in air, excuse me.
21 Secondly, zirconium air reaction can occur even if oxygen
22 is depleted via exothermic zirconium nitrogen reactions.

23 And associated particularly with the
24 hydride issue is the point that ignition temperature may
25 be an inappropriate criterion, in fact energy balance may

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1 be more appropriate criterion for the determining
2 whether a fire initiates.

3 The letter also stated that the staff had
4 neglected exothermic reactions of aluminum and stainless
5 steel. In the event that a fire initiated, they said
6 that the staff had neglected the potential release of
7 small particles arising from decrepitation of fuel.

8 And they further stated that the MACS code
9 was prone to using an excessively narrow plume and
10 therefore could underestimate land contamination.

11 So these issues have not been addressed in
12 the current study, that I can see. Perhaps the staff
13 would explain to me how they've been addressed.

14 But if this problem were looked at in a
15 really systematic science-based manner, the scientific
16 community more broadly could examine all of these issues
17 and, if done correctly, we'd have a really solid
18 understanding of the underlying phenomena and then, and
19 only then, reach regulatory conclusions.

20 And in the interim, I think it's prudent to
21 take a conservative position that these findings would
22 lead to an identification of the substantial range of
23 circumstances wherein a pool fire could occur.

24 And just some closing points about the
25 responsibilities of NRC in this matter, the NRC is the

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1 world's biggest regulator. And therefore is looked to
2 by regulators in other nations and, I believe, has the
3 global responsibility to establish a thorough
4 understanding of the pool fire issue.

5 And an illustration of the significance of
6 this, I have personally viewed a six PWR unit station in
7 Asia where the spent fuel pools are all above grade. I'm
8 also aware of large nuclear facility in a European
9 country that is licensed to hold in excess of 17,000 tons
10 of spent PWR fuel in four high density spent fuel pools
11 configured so that the grade level is approximately
12 mid-height of the fuel.

13 And undoubtedly other situations like this
14 can be identified around the world. So I emphasize that
15 NRC has a global responsibility to really come to grips
16 with the phenomena of a pool fire.

17 And finally, on the security issue, the
18 United States Government reserves the right to conduct
19 aerial strikes on countries around the world, and has
20 done so frequently. The NRC has chosen not to require
21 air defense of U.S. nuclear power plants.

22 If you put those actions together, I believe
23 it's the NRC's duty to accurately inform the United
24 States public of the phenomena associated with a spent
25 fuel pool fire. Thank you. That's my commentary.

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1 MS. UHLE: Okay. I want to thank you for
2 your comments. We do have a few bits of information we'd
3 like to convey in response to, hopefully, fill in some
4 information to you and the members of the public
5 regarding the validation of the MELCOR code that we used
6 and the tests that we have conducted and used to do so.
7 So Hossein Esmaili?

8 MR. ESMAILI: Okay. This is Hossein
9 Esmaili. Thank you for your comment. And we do share
10 some of your concerns. That's why we are ever improving
11 the code. We do run experiments, et cetera.

12 And during the past 13 years or so, decade or so,
13 we have run experiments at Argonne to characterize air
14 oxidation. This is compiled in NUREG-6846 for your
15 information. So we do have the characterization of
16 breakaway air oxidation in those experiments. These are
17 input into the MELCOR.

18 And finally, at the end of the day, we do
19 validation of MELCOR. This is, again, straining against
20 the zirc fire experiments for BWR assemblies that was run
21 from 2004 to 2006, I believe. And currently we are doing
22 the same for the PWR fuel assemblies.

23 The BWR fuel assemblies, zirc fire
24 experiments have been compiled. It's in NUREG-CR-7143
25 that shows validation of MELCOR against those

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1 experiments. It also includes code-to-code
2 comparisons, adequacy of radiation models that you
3 mentioned. And I guess that's about it.

4 As far as validation of MELCOR is concerned,
5 we feel that MELCOR is adequately validated against
6 experiments. That's why it gave us the confidence to do
7 the analysis. Thank you.

8 MR. RAKOVAN: Okay. If we could go ahead
9 and go to our last speaker before lunch. And I've
10 already apologized to him, to making him go last before
11 lunch. Ed Lyman, from the Union of Concerned
12 Scientists, please.

13 MR. LYMAN: Thank you. And thank you for
14 entertaining the questions today. I just have a few
15 questions on the draft study.

16 So the first point does go to the 72 hour
17 truncation. And the guidelines for the study are that
18 all the calculations are cut off after 72 hours. That's
19 one of the basic guidelines.

20 We think that is arbitrary. And I think my
21 colleague, David Lochbaum, by raising the Unit 4 chaos,
22 the real point of that is that it's quite plausible that
23 in a severe accident situation after 72 hours the recipe
24 for how to mitigate may still be unclear. The
25 circumstances may be unclear.

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1 So in that context, I'd like to ask about
2 Figure 55 versus Figure 57. So it seems a big part of
3 your argument is that when you get to OCP-4 and five that
4 there's no risk of ignition, even in the high density
5 pool. But that's at 72 hours.

6 So if you look at 55, which is the
7 unmitigated high density small leak in OCP-4, at 72 hours
8 it's a little hard to tell, but it looks like it has a
9 positive slope.

10 So my question is, have you run the
11 calculation out to a longer period of time? And if so,
12 when does ignition occur eventually from that situation?
13 And I raise that because if you look at Figure 57 again,
14 this is just eyeballing the curve. So
15 that's the low density small leak in OCP-4. It looks
16 like it's a zero slope. And so it looks like it's reached
17 a steady state temperature, in which case, if you go out
18 to longer than three days, your conclusion that it's air
19 coolable may be true only for the low density case and
20 not for the high density case. So that's my question.

21 MR. SHERON: Yes, Ed, it's Brian Sheron.
22 We recognize that we truncated the 72 hours. It was felt
23 that there was, that provided sufficient time for
24 operators to take mitigative actions.

25 They do have their procedures for dealing

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1 with situations like that. They've put in place the FLEX
2 program and so forth. And on top of that, the 72 hours
3 is not an absolute.

4 In other words, it's not like everything all
5 of sudden goes to a pool fire or whatever at 72 hours.
6 There were some sensitivity studies done that show that
7 even beyond that the heat-up takes a long time.

8 MR. LYMAN: Right. But you didn't do the
9 sensitivity study with regard to duration for this
10 particular scenario, for the OCP-4. And that's
11 specifically the question I'm asking now.

12 MR. ESMAILI: Actually we did. After we
13 published the report and everything.

14 MR. LYMAN: Okay.

15 MR. ESMAILI: So just looking at one of
16 these figures, let's look at 53. I did extend that. As
17 you can see, the temperature is going up by three days.
18 I extended it to another two days.

19 The temperature goes up by only about 18
20 degrees heat. And so we are never going, in OCP-4, we
21 are never nearing a zirc fire even in five days. And just
22 extrapolating those temperatures, I don't think we are
23 going to get into a zirc fire anytime soon.

24 So I did. So the temperature is going on
25 so, so slowly that I don't expect a zirconium fire, even

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1 in the high density, for a moderate case.

2 MR. LYMAN: So you said it was another 18
3 degrees elsius after two days.

4 MR. ESMAILI: After two days.

5 MR. LYMAN: But if you just drew a straight
6 line, so it's leveling off after that, right?

7 MR. ESMAILI: Yes. It's slightly going up
8 because the temperature in the building is getting hot.
9 So you're losing some of the heat transfer. But other
10 heat transfer mechanisms aren't there.

11 MR. LYMAN: Okay. So you didn't calculate
12 the time to the failure though, right.

13 MR. ESMAILI: No. We still felt that three
14 days was a good truncation time.

15 MR. LYMAN: All right. So I think Gordon
16 just raised this quickly. But when you have a situation
17 of air oxidation, so you looked at enhanced ruthenium
18 source term. But you didn't look at enhanced low
19 volatile source terms.

20 So it is true if you have the decrepitation
21 of spent fuel in air that you're going to get more fuel
22 finds so you can have a larger low volatile source term.

23 But looking at, I think it's Figure 94
24 versus 95, it looks like you have the same curve for both.
25 So I was wondering why you didn't take that into account.

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1 MR. ESMAILI: Okay. Regarding
2 decrepitation, this came up in the ACRS letter of 2000.
3 And there were some concerns. I think this is based on
4 the early Canadian test that showed that if you expose
5 fuel compact to air that's what happens.

6 Right now, we think that for the fuel rods that we
7 have with the oxidized cladding, we don't expect any
8 substantial amount of aerosol formation.

9 Regarding ruthenium release and other enhanced
10 releases, what we did, I think you know that we did change
11 the vapor pressure in ruthenium class in MELCOR to be more
12 representative of a ruthenium oxide. So we do enhanced
13 ruthenium releases.

14 But this is, we think, it's slightly maybe
15 conservative. But we are checking against the recent
16 French test, the Verdun test. It's not completed yet, but
17 we're still analyzing.

18 MR. LYMAN: Okay. Let's see. Now, when
19 you compare the two pool configurations, so in the low
20 density configuration you have to go to checkerboarding
21 for some of the fuel in the exterior. And that's because
22 you can't discharge anything that's hasn't been cooled
23 five years. Is that correct?

24 MR. ESMAILI: That's correct. I still
25 keep the fuel for about five years in.

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1 MR. LYMAN: Right. But you could
2 conceivably move fuel to dry casks after three years?

3 MR. ESMAILI: I think there is --

4 MS. UHLE: Yes. I believe some designs
5 allow that. The current practice is that it's five
6 years.

7 MR. LYMAN: Right. But it is possible you
8 could go to a one by four of empties, even low density
9 if you discharged after three years. And I was wondering
10 if that would make any kind of difference, do you think?

11 MR. ESMAILI: Even if I remove that
12 checkerboard pattern, that checkerboard pattern is the
13 fuel that's two years old.

14 MR. LYMAN: Right.

15 MR. ESMAILI: So that is not contributing
16 a lot. The releases are very low for the low density
17 cases. It's dominated by the 284 assemblies that have
18 been discharged. So I don't think it makes that much of
19 a difference.

20 MR. LYMAN: Okay.

21 MR. WITT: This is Kevin Witt. If I could
22 add something on that. For three year discharge fuel,
23 we think that there would be significant amount more
24 casks needed to do that.

25 Because you're not able to load the same

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1 type of fuel that you would at five years, or even seven
2 or eight years. And so the costs for that type of
3 scenario would significantly increase in the
4 cost/benefit analysis.

5 MR. LYMAN: Now, you did find that there's
6 no hydrogen combustion in any of the low density
7 scenarios while there is in some of the high density. So
8 isn't there a value in itself of removing that large mass
9 of zirconium from the reactor and spent fuel system?

10 Right now there's DOE's working on trying to
11 develop fuels that don't have zirconium cladding. So if
12 you had an opportunity to remove a large amount of
13 zirconium and reduce the risk of hydrogen combustion,
14 isn't that a value? You can't quantify it necessarily
15 beyond what you've done. But isn't that a qualitative
16 factor that might also --

17 MR. ESMAILI: We relied on the reg analysis
18 to show what the benefit of removing this. Yes, we did
19 not calculate releases. But the delta between the high
20 density and low density shows there is a substantial --

21 MR. LYMAN: Sure, I realize. But do you
22 think that, just in general, to greatly reduce the risk
23 of hydrogen combustion, this of course another Tier 3
24 issue, is addressing hydrogen mitigation. And so this
25 could also be viewed as a hydrogen mitigation effort.

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1 MR. ESMAILI: I think just talking about
2 the reactor building here, the reactor building here is
3 not really a containment.

4 MR. LYMAN: No, I know. But --

5 MS. UHLE: I'm sorry, this is Jennifer Uhle
6 from NRR. Is your question that if we remove more of the
7 fuel, say the three to five year old fuel, I think you're
8 saying that it would reduce the probability of hydrogen
9 detonation.

10 MR. LYMAN: No. I'm just talking about --

11 MS. UHLE: Is that what you're saying?

12 MR. LYMAN: -- what's evaluating the study.
13 I could find the quotation, but there is no scenario with
14 low density loading led to hydrogen combustion, right,
15 while there are a number of the high density loadings that
16 did.

17 And that's partly because of the much larger
18 amount of zirconium that is oxidized. So I'm saying
19 that, in itself, is a value which should be considered
20 separately as a qualitative factor in the regulatory
21 analysis.

22 MS. UHLE: And our regulatory analyses are
23 looking specifically at the increase or decrease in
24 safety to the public. So that --

25 MR. LYMAN: Yes. But I'm saying that

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1 reducing the risk of a hydrogen explosion anywhere in the
2 reactor, because there's collateral damage when you had
3 a hydrogen explosion in one reactor at Fukushima.

4 Then it interfered with the ability to
5 mitigate the reactor next to it. So I'd think that
6 reducing the risk of hydrogen detonation is another
7 consideration. But I'll leave --

8 MS. UHLE: Well, I guess my point I'm trying
9 to make is that there is no difference in the probability
10 of release between the low density and the high density.
11 What's different is the amount of source term release.
12 So I don't see that the reduction in the hydrogen --

13 MR. LYMAN: Right.

14 MS. UHLE: -- detonation is going to affect
15 safety directly.

16 MR. LYMAN: So there's no general value in
17 reducing the probability of a hydrogen explosion,
18 whether or not it enhances the release? That seems to
19 be not a reasonable position.

20 And I want to ask you about some of the
21 calculations with the sprays where it kind of corrupted,
22 right. Footnote 30 says that it failed after ten hours.

23 MR. ESMAILI: One of the calculations, what
24 page are you on?

25 MR. LYMAN: This is Footnote 30, sorry.

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1 It's Page 122.

2 MR. ESMAILI: Yes. Okay, but by that time
3 this was just a numerical issue. It had already
4 stabilized. The temperatures are already stabilized.
5 We could have gone back and re-started calculation, make
6 something.

7 But I didn't see any benefit to that,
8 because the spray was sufficient to remove the decay
9 heat. The temperatures were stabilized and nothing
10 would have happened after that.

11 MR. LYMAN: So you don't think this reveals
12 any concerns with MELCOR in general or this --

13 MR. ESMAILI: Not really, because --

14 MR. LYMAN: -- the flow regime model?

15 MR. ESMAILI: Not really, because this is
16 a very, MELCOR is a system level code. We always run into
17 problems when we are running calculations.

18 So this is, this is not a bug issue. This
19 is, we start a calculation, it's a time stamping issues.
20 So we always have to do calculation. It has nothing to
21 do with any bug in the code.

22 MR. LYMAN: Okay. Now, the general issue
23 of whether this is adequate for input into a regulatory
24 analysis -- I raised in the last meeting, first of all,
25 what the actual baseline is.

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1 And I understand the regulatory analysis
2 says you have to assume that all reactors are in
3 compliance with current rules and regulations. But as
4 far as the baseline spent fuel pool configuration, the
5 common requirements fall short of actually saying thou
6 shalt maintain a one by four, right. It's not a
7 requirement, but it's an objective.

8 But you are assuming that the baseline is
9 the one by four high density. And so if we don't know
10 that's actually the case with the fleet, how can the
11 public have assurance that's the correct baseline, and
12 you don't have some pools with configurations that are
13 higher risk?

14 MR. ESMAILI: We have done calculations
15 with contiguous pattern, with a uniform flow pattern.
16 That information is available. And I think the reg
17 analysis, that was provided. It is taken care of in the
18 reg analysis. So we do have that information available.

19 MR. LYMAN: And the information is there,
20 but the baseline is still the assumption that the current
21 pool configurations are one by four.

22 MR. ESMAILI: For this particular plant.
23 Because this particular plant, Peach Bottom, it actually
24 does a little bit better than --

25 MR. LYMAN: Yes, I realize.

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1 MR. ESMAILI: -- one by eight. But when
2 you apply it to other plants --

3 MR. LYMAN: But if the question is, is there
4 a significant safety benefit to low density, you have to
5 know what you're comparing that to on a fleet-wide basis.

6 And if there are some reactors that haven't
7 actually achieved one by four, then there would be a
8 greater safety benefit to going low density than there
9 would be if they were one by four.

10 So the question is what is the current
11 baseline of the fleet? You also assume full offload
12 capacity, right, in the baseline. We know that's not
13 true for all reactors.

14 MR. JONES: This is Steve Jones. What I
15 can say is we have evaluations that address certain
16 strategies. They're required to maintain those
17 strategies. And to a large extent, they include those
18 one by four baseline patterns.

19 I don't know how to address that on a
20 plant-specific basis. From a regulatory analysis
21 perspective, we are generally assuming, given the
22 initiating event, that the event proceeds to a release
23 for bounding cases. And that, therefore, covers any
24 variability among the fleet that might be missed by the
25 specific assumptions.

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1 MR. LYMAN: So basically, it's the low
2 probability of the initiating event is the only real
3 consideration here at all. It's so low that your
4 cost/benefit analysis is never going to show benefit.

5 And it really doesn't matter whether you
6 have 100 percent release or anything. It's really all
7 based on that very low number. So you didn't even need
8 to do this whole study. You just need to stop at that.

9 MS. UHLE: Well, it's not just the low
10 probability. That does affect it. But, of course, it
11 is also based on the physics of the source term release,
12 the timing of the release based on the timing so that
13 protective action measures can be taken.

14 So there's a number of physics that are
15 involved, radiation health modeling that are then
16 incorporated into our analysis to look at the public
17 health and safety benefit of moving to the low density
18 versus the high density. So it's not just a probability
19 argument.

20 MR. RAKOVAN: Ed, do you maybe have one more
21 question that we can wrap up with?

22 MR. LYMAN: I guess I will stop there.
23 Thanks.

24 MR. RAKOVAN: Okay. Let's go ahead and
25 break for lunch then. When we come back from lunch, I'd

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1 like to go to John Sipos, David Weisman and then Tom
2 Cochran. We'll take an hour for lunch. So let's try to
3 be back here at 1 o'clock so we can get started shortly
4 after 1:00.

5 (Whereupon, the foregoing matter went off
6 the record at 12:00 p.m. and went back on the record at
7 1:00 p.m.)

8 MR. RAKOVAN: Welcome back, everyone. I
9 hope everyone had at least a fair lunch, if not a good
10 one. I'm going to continue. This is Lance Rakovan
11 again, facilitating the meeting.

12 I'm going to continue to go through those
13 who pre-signed up to speak today. And we'll hopefully
14 try to get through everyone in the next four hours.

15 As I said before lunch, we're going to go
16 to John Sipos, then David Weisman, and then Tom Cochran.
17 I'll try to give a three person, you know, queue if you
18 will so people know when their time is coming up so they
19 can prepare. So Mr. Sipos, if you would, please.

20 MR. SIPOS: Thank you very much. Good
21 afternoon, everyone. My name is John Sipos, for those
22 of you who I haven't met. On behalf of the State of New
23 York for whom I work, I would like to express the thanks
24 to NRC and to the distinguished group of people here today
25 for holding this public meeting.

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1 It's very important, I think, for the
2 process. And it is an important issue, and it is an
3 important issue to the State. So thank you very much.
4 I appreciate that very much.

5 Just one question I had at the beginning.
6 Is this hearing or meeting being transcribed? I think
7 there was a question about that.

8 MR. RAKOVAN: Yes, the meeting is being
9 both transcribed, and since we are webcasting it, we
10 should have the archive of that, as well.

11 MR. SIPOS: Fantastic. Some preliminary
12 questions, and I guess I'll direct them either to Dr.
13 Sheron or Dr. Uhle or whoever else is on the panel. But
14 as I understand the consequence study, it examined a type
15 of severe accident at a spent fuel pool at the Peach
16 Bottom Atomic Power Reactor Site, correct?

17 MR. SHERON: Yes.

18 MR. SIPOS: And so the consequence study
19 was a site specific severe accident analysis of a spent
20 fuel pool accident, is that correct?

21 MR. SHERON: Yes, it was for one reactor.

22 MR. SIPOS: Okay. And the consequence
23 study used a computer code known as MACCS, M-A-C-C-S,
24 numeral 2?

25 MR. SHERON: Yes, I think, yes that was the

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1 correct one.

2 MR. SIPOS: And from our experience in the
3 Indian Point proceedings, we understand that and I think
4 Dr. Ooly, is it Ooly or --

5 MS. UHLE: It's Uhle. But I answer to most
6 everything.

7 MR. SIPOS: Uhle, excuse me. Uhle, I'll
8 try to pronounce that correctly. Thank you. That's for
9 the MELCOR Accident Consequence Code System, I guess
10 that's the acronym, is that correct?

11 And from our experience in Indian Point, we
12 understand that it's also used for site specific severe
13 reactor accident analyses as well, correct?

14 MR. SHERON: Yes.

15 MR. SIPOS: Okay. And amongst the NRC
16 staff, can you tell us who was the principal author of
17 Chapter 7 of the consequence study? Understanding you
18 all work as a team. Yes, sir and I haven't met you so
19 I'm not sure who you are.

20 MR. NOSEK: Hi, my name is A.J. Nosek. I'm
21 from the Office of Research.

22 MR. COMPTON: I'll introduce myself. I've
23 worked also with A.J. on Chapter 7, and a few of the other
24 consequence pieces. I'm Keith Compton.

25 MR. SIPOS: Thank you very much. And as

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1 part of the MACCS2 analysis that was done, who performed
2 that aspect of the consequence study?

3 MR. NOSEK: I did.

4 MR. SIPOS: And so you were responsible for
5 the inputs that were made to the MACCS2 code analysis,
6 is that correct?

7 MR. NOSEK: Yes.

8 MR. SIPOS: Okay. And did you also make
9 the decisions as to what values should be used for the
10 inputs?

11 MR. NOSEK: Yes.

12 MR. SIPOS: Okay. And what version of the
13 MACCS2 code did you use? I read in the report I think
14 it was revision 3.7.0?

15 MR. NOSEK: Correct.

16 MR. SIPOS: Okay. And was it MACCS2 or
17 WinMACCS?

18 MR. NOSEK: So WinMACCS is the user
19 interface that we now have a framework for MACCS2. So
20 MACCS2 is one of the components within the WinMACCS
21 interface. So you could say I use WinMACCS/MACCS2.

22 MR. SIPOS: Okay, thank you. And how many
23 runs of the MACCS2 code were performed?

24 MR. NOSEK: That's a good question. It
25 depends on what you consider a code calculation and for

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1 what purpose. For our base case scenarios of these spent
2 fuel pool study they were looking at, we had seven major
3 source terms we were looking at.

4 And of those, we had a number of different
5 weather trials within there. And yes? We had upwards
6 of 1,000 weather trials per scenario, and we also looked
7 at a number of different sensitivities within those base
8 cases for different dose truncations or NLNC
9 calculations. So seven times three times upwards of
10 1,000.

11 MR. SIPOS: And we were using the term run.
12 I've also seen the term case used with respect to MACCS.
13 Are those interchangeable in your understanding or in
14 your parlance?

15 MR. NOSEK: Yes. It depends on the
16 context.

17 MR. SIPOS: And you also mentioned
18 sensitivity studies, or sensitivity analyses. Those
19 also factor into the number of runs that were performed,
20 is that correct?

21 MR. NOSEK: There was additional runs done
22 for sensitivities. Each in both the, I believe, Chapter
23 9? I don't know if it's still Chapter 9, but the
24 sensitivities chapter as well as in support of the
25 regulatory analysis as well.

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1 MR. SIPOS: Okay. And did both of you also
2 work on Chapter 9? I should have asked that earlier.
3 Yes?

4 MR. NOSEK: Yes.

5 MR. SIPOS: Thanks. And do you know
6 roughly when those MACCS runs were performed?

7 MR. NOSEK: The final calculations were in
8 the span of around November and December of last year.

9 MR. SIPOS: Okay, 2012. And there were
10 earlier runs done, as well, it sounds like?

11 MR. NOSEK: Yes. I mean, we will, as we
12 refine our calculations will be doing a number of
13 different runs.

14 MR. SIPOS: And were each of those runs
15 documented in some manner?

16 MR. NOSEK: The ones that were documented
17 were the final runs and the sensitivities.

18 MR. SIPOS: Okay. And were the runs that
19 were done prior to the end of 2012, were they also
20 documented?

21 MR. NOSEK: I do not believe they were
22 documented in the final report.

23 MR. SIPOS: Would it be possible for the
24 state to get copies of the input and output files for the
25 runs for which there is documentation?

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1 MS. UHLE: The question of what we have as
2 far as distribution is if there was any proprietary
3 information from the site. So can we get back to you on
4 that question? And the only concern would be the
5 proprietary nature of the data, recognizing your state.

6 I know there's different arrangements that
7 can be made. So I think it's hard to answer just off the
8 top of our head.

9 MR. SIPOS: Okay, well --

10 MS. UHLE: We can meet with you after the
11 meeting and continue the discussion. That would be
12 helpful to us.

13 MR. SIPOS: I appreciate that.

14 MR. NOSEK: We leveraged to allow the best
15 practices from the SOARCA report. And we do have a
16 report becoming available that much of those inputs will
17 become available in that document.

18 MR. SIPOS: And just to close the circle on
19 that, this state is interested in seeing the input and
20 outputs and the results. What went into the runs, what
21 the runs generated, so that we could look at it as well.
22 Thank you.

23 And were there quality assurance or quality
24 control aspects of the runs? Did either of you perform
25 QA/QC on the runs?

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1 MR. NOSEK: Yes. I mean, one of the number
2 of reasons that we do a number of calculations up into
3 our final runs is as a quality assurance measure.

4 In addition, we also had our subject matter
5 expert from Sandia review all the inputs. And we also
6 had the ACRS review our report.

7 MR. SIPOS: And the subject matter expert
8 from Sandia, would that be Nate Bixler?

9 MR. NOSEK: Correct.

10 MR. SIPOS: And Joe Jones?

11 MR. NOSEK: Correct.

12 MR. SIPOS: And the rest of the Sandia
13 people that are listed, I think, on the second or third
14 page of the report?

15 MR. NOSEK: Not off the top of my head.

16 MR. SIPOS: I could read --

17 MR. NOSEK: I do not know who's on that
18 paper.

19 MS. UHLE: I believe some of those people
20 are the MELCOR support.

21 MR. SIPOS: Right, there is --

22 MS. UHLE: So we can't say off the top of
23 our head whether or not they are all for MACCS.

24 MR. SIPOS: Okay. But Nate Bixler is, I
25 guess, the custodian of the code for Sandia? So he was

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1 involved in it, correct?

2 MR. NOSEK: Correct.

3 MR. SIPOS: And Mr. Jones, as well?

4 MR. NOSEK: Yes.

5 MR. SIPOS: Okay. And I think this is set
6 out in the reporter, the information digest. But our
7 understanding is that the Peach Bottom site has two
8 reactors, each with a spent fuel pool.

9 So there's two pools, two reactors at the
10 Peach Bottom site, correct? And this study looked at an
11 accident to one of those pools, correct?

12 MR. SHERON: Yes.

13 MR. SIPOS: Okay. And Peach Bottom is
14 located central Pennsylvania roughly, I don't know, 18
15 miles from Lancaster, Pennsylvania, correct?

16 MR. SHERON: I believe so, yes.

17 MR. SIPOS: Okay. And I checked the 1996
18 generic environmental impact statement for license
19 renewal. And I think as of 1990, which was the
20 population data that was used in this study, there were
21 roughly 4.7 million people that lived within a 50 mile
22 radius of Peach Bottom. Is that square with your general
23 knowledge? I got it from the GEIS at Table 2.1.

24 MR. NOSEK: I do not recall the population
25 off the top of my head. But that seems feasible.

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1 MR. SIPOS: And I have a couple of questions
2 that I think Lance, I'm sorry excuse me, that Kevin was
3 discussing this morning concerning the relationship with
4 other activities that NRC is conducting right now.

5 And I think on the PowerPoint that you
6 handed out this morning, Page 14, it looks like the
7 consequence study is expected to be finalized very soon
8 by NRC staff, correct?

9 MR. WITT: Yes, they are both expected to
10 be provided at the commission on or before October 11th.

11 MR. SIPOS: Okay. And that would be before
12 the public comment period ends on the waste confidence
13 proceeding, is that correct?

14 MR. WITT: That is correct. I believe the
15 waste confidence comment period ends late November.

16 MR. SIPOS: Right, around Thanksgiving, I
17 think. And I think going back to Page 4 of the hand out
18 from this morning, there was a statement that the
19 schedules have been aligned to facilitate public
20 involvement with the Tier 3 issue, the study, and ongoing
21 waste confidence activities and relating policy issues.
22 And it sounds like that is exactly what is going on,
23 correct?

24 MR. WITT: That is correct.

25 MR. SIPOS: And just to be clear, when you

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1 talk about the Tier 3 issue, you're talking about the
2 regulatory analysis or Appendix D that is attached to the
3 consequence study?

4 MR. WITT: Those are two slightly different
5 documents. The Tier 3 analysis is a generic regulatory
6 analysis applicable to all plants. The Appendix D of the
7 spent fuel pool study was done for that specific plant
8 studied in the report.

9 MR. SIPOS: Okay, thank you. I appreciate
10 that clarification. I guess I would like to come back
11 to the MACCS2 issues that were part of the consequence
12 study. Could you tell us what role Dr. Bixler played in
13 the MACCS2 analyses that were done?

14 MR. NOSEK: Nate Bixler is a consultant,
15 and he also is a lead developer for the MACCS2 code. And
16 so we use him as consulting support. But we did the
17 calculations and the model development in-house.

18 MR. SIPOS: And did he make any suggestions
19 regarding inputs or assumptions to any of the inputs?

20 MR. NOSEK: Yes, where necessary.

21 MR. SIPOS: And could you summarize what
22 those suggestions were by Dr. Bixler?

23 MR. NOSEK: On an overall scheme of things,
24 the models that we started with were leveraged from
25 SOARCA. So our initial starting point was harnessing

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1 the best practices from that report, which also is Peach
2 Bottom, which has site specific meteorology and
3 geography.

4 So it's also very applicable to our site.
5 And starting from there, we took the source terms
6 generated from the MELCOR code to make it specific to the
7 spent fuel pool study, as well as updates regarding the
8 emergency response aspects. And a few variety of small
9 changes to inputs from different areas.

10 MR. SIPOS: And did Mr. Jones make any
11 recommendations?

12 MR. NOSEK: Mr. Jones was assisting NSRG in
13 recommendations for the emergency preparedness and the
14 emergency response and all the protective actions in that
15 part of the code.

16 MR. SIPOS: And when you refer to
17 protective actions, are you referring to the protection
18 action guidelines that EPA has developed?

19 MR. NOSEK: Partly. Bottling the
20 emergency response and evacuation as a whole. So
21 including emergency phase relocation, evacuation,
22 shelter in place, and setting up an appropriate response
23 based on the site's emergency action levels, and the
24 specific evacuation time estimates.

25 MR. SIPOS: There's another individual at

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1 Sandia, I may be mispronouncing his name, Randal is it
2 Gauntt, and my understanding is he's done work with
3 MELCOR as opposed to MACCS. Did he have any involvement
4 with the MACCS analysis that was performed as part of the
5 consequence study?

6 MR. NOSEK: Not directly.

7 MR. SIPOS: But he does have experience
8 with MELCOR, correct?

9 MR. NOSEK: Correct.

10 MR. SIPOS: Okay. And did he work on any of
11 the MELCOR aspects of the consequence study?

12 MR. ESMAILI: No, he did not.

13 MR. SIPOS: Thank you.

14 MR. RAKOVAN: Sir, just one or two more
15 questions, if you wouldn't mind. Sorry, I'm sitting
16 down right here. I was trying to stay out of the way of
17 everybody. Just a couple more questions, and then we'll
18 move on to the next speaker, please.

19 MR. SIPOS: It also appears that Oak Ridge
20 National Laboratories had some role in the consequence
21 study. Could one of the NRC staff members here summarize
22 the role of Oak Ridge?

23 MR. ESMAILI: Oak Ridge did two things for
24 us. First, provided the inventories, you know,
25 radionuclide inventories. So they did a scale origin

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1 calculations for us.

2 And they also did, you know, doses in the
3 refueling flow, once the spent fuel pool becomes
4 uncovered to see what the radiation levels would be.
5 These are all documented in the report. I believe it's
6 in Chapter 5.

7 MR. RAKOVAN: Thank you, Hossein.

8 MR. ESMAILI: Yes.

9 MR. RAKOVAN: I was just trying to get your
10 name into the statement, that's all.

11 MR. ESMAILI: Why he keeps telling it.
12 Sorry.

13 MR. SIPOS: Thank you very much. And also,
14 there was a company, DAKOTA, LLC. Could anyone describe
15 what their role was? I may be mispronouncing it.

16 MR. ESMAILI: Correct. The individual is
17 Casey Wagner. He was, at the time, he's right now at
18 DAKOTA but he used to be at Sandia. So he was involved
19 in, you know, the MELCOR code development, applications,
20 et cetera. So we used him to some extent, you know, as
21 a consultant.

22 MR. SIPOS: But it was on the MELCOR side
23 of --

24 MR. ESMAILI: On the MELCOR side.

25 MR. SIPOS: Thank you. Just I notice there

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1 were three people involved in the study who's last name
2 was Wagner. Any relationship amongst them?

3 MR. ESMAILI: No.

4 MR. SIPOS: Thank you. I do have further
5 questions. Thank you. I do have further questions, but
6 recognizing that there are a number of people, as I said,
7 my flight is very late. I'm happy to have other people
8 --

9 MR. RAKOVAN: If we have time, we'll loop
10 around to you.

11 MR. SIPOS: Thank you very much.

12 MR. RAKOVAN: Okay, thank you. If we could
13 go to David Weisman, who I believe is on the phone,
14 followed by Tom Cochran and then Kyle Landis-Marinello.
15 Operator, can we see if David Weisman is on the phone,
16 please?

17 OPERATOR: Yes, please press Star 1 if you
18 are connected.

19 MR. RAKOVAN: Mr. Weisman, are you there?

20 MR. WEISMAN: Hello. Are you there?

21 OPERATOR: Mr. Weisman, your line is now
22 open.

23 MR. RAKOVAN: Please go ahead, David. We
24 can hear you.

25 MR. WEISMAN: David Weisman, Alliance for

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1 Nuclear Responsibility. Yes, it's funny. As this call
2 began this morning, I was actually just watching the
3 first rays of the sun on the Pacific Ocean out the window,
4 for those of us here on the other coast.

5 And I must say while I never tire of that,
6 I was quite tired at that hour. But looking at the
7 Pacific brought in mind two questions regarding this
8 study. It seems there's a motivating factor in the
9 decision making that has triggered by the events of
10 Fukushima and it's aftermath.

11 And so my first of two questions is since
12 you are using a seismic event of great magnitude as your
13 trigger event, why choose Peach Bottom, particularly
14 since the geology of that site, when you're looking to
15 consider probabilistic risk, occurrence, and magnitude,
16 is one of relative geologic stability?

17 Why not choose instead, since you did need
18 a GE boiling water reactor for comparison, the Colombia
19 Generating Site, and albeit a Mark II but close enough,
20 which is tangential to the Cascadia Subduction Zone of
21 the Pacific Northwest, which the USGS has stated is
22 capable of a 9.0 magnitude quake.

23 So you have two similarities to Fukushima,
24 subduction zone, magnitude 9. And thus from a
25 perspective of looking at both the type of reactor,

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1 General Electric boiling water reactor, and the
2 triggering mechanism, subduction zone 9.0, more of a
3 closely related analog to the Fukushima situation.

4 And that was my first of two questions.
5 Either I can give you the second question, or you can take
6 a crack at that one.

7 MR. RAKOVAN: Let's go one at a time, if you
8 would.

9 MR. WEISMAN: All right.

10 MS. UHLE: This is Jennifer Uhle from NRR.
11 The reason why the Peach Bottom site was chosen was a
12 matter of expediency. We had a lot of models already
13 prepared as part of several other studies that we had been
14 conducting.

15 And so that facilitated, you know, the
16 calculation of what would occur at that particular plant.
17 Now we recognize that the seismicity varies across the
18 fleet of reactors.

19 And so we didn't just look at the
20 probabilities in terms of the Peach Bottom plant in the
21 spent fuel pool study. We are, as part of our Tier 3
22 analysis, which is the main regulatory decision making
23 document, we looked at the seismicity variations.

24 And we increased the probabilities of this
25 particular size, or this particular level of

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1 acceleration and considered that in the sensitivity
2 studies in the regulatory analyses.

3 And I just want to look to Fred Schofer, if
4 you want to add anything to that Fred to further clarify.
5 Do you think I managed to -- is that okay? Okay. Okay,
6 thanks. So that is how we accounted for the higher
7 seismicity in the other pools.

8 MR. WEISMAN: But do we know that you're
9 extrapolations pulled out to, for example, subduction
10 zone 9.0 Pacific Northwest size that would be equivalent
11 to a Fukushima event?

12 MS. UHLE: The accelerations that was
13 actually seen at, I'm going to pronounce it Fukushima,
14 was actually .56g. The actual accelerations we used at
15 Peach Bottom was at the spent fuel pool scoping study,
16 was .7g. So we actually bounded the acceleration.

17 MR. WEISMAN: Well that would be for the
18 Peach Bottom. Of course, again for those of us here on
19 the other coast, we have your highest here at Diablo
20 Canyon, which would be .75g. But I will go with that,
21 that it was expediency.

22 MS. UHLE: Well, but again we didn't stop
23 there. When we did our regulatory analysis, we
24 increased the probability of seeing these accelerations
25 so that this additional seismic risk was captured when

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1 we looked at the overall potential safety improvement by
2 going to the lower density loading.

3 So at this stage, you have not yet seen the
4 document that I'm talking about, which is the Tier 3
5 document. We have not completed it. We wanted to have
6 this public meeting to get some feedback from everybody.

7 So that document that will provide our
8 approach, that I think will answer your question
9 specifically will be available at the end of September.
10 And then we are going to have an advisory committee and
11 reactor safeguards meeting, a public meeting.

12 That is again available for people to
13 participate, or excuse me, to witness. And that is, I
14 can't remember the date exactly. It's October 2nd. So
15 I think that looking at the document when it becomes
16 available, I think that would help answer your question.

17 MR. WEISMAN: All right. Then we'll move
18 to the second question.

19 MS. UHLE: Well, actually I think Steve
20 Jones from NRR is an expert in spent fuel pools in the
21 office, is going to add a few more statements.

22 MR. JONES: Oh, I just wanted to clarify
23 with respect to the west coast plants, the seismic data
24 we have is somewhat older and not directly compatible
25 with the 2008 eastern and central USGS information.

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1 So we are looking forward to 2015 when we
2 expect to have the more updated seismic hazard curves
3 available to fully assess the west coast reactors.

4 MR. WEISMAN: All right. Well as long as
5 we'll stick on the west coast here. Second question is
6 that your study is, in a broader sense, addressing cross
7 risk analysis in terms of overall reduction, the benefits
8 of overall reduction of the expedited transfer relative
9 to, let's say the potential consequences of human
10 exposure, et cetera.

11 Add to this, though, that the NRC slogan,
12 if I'm not mistaken, is protecting humans and the
13 environment, and so I'm going to go to another population
14 at risk which hasn't been, I think, addressed yet,
15 affected by spent fuel pools. And that would be the
16 marine environment.

17 And I'm thinking of this not necessarily in
18 terms of radionuclides, but of the aquatic species,
19 larva, et cetera because if I am not mistaken, spent fuel
20 pools at costal locations, at least the case at Diablo
21 Canyon here, use a portion of the stream of their once
22 through cooling water, and it may be a lower volume, 25
23 percent of the intake volume, to provide cooling for the
24 spent fuel pools.

25 And I don't know if that's the case on your

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1 eastern plants like Port St. Lucie or Turkey Point in
2 Florida. These are all costal plants that don't use
3 cooling towers, but rely on once through cooling to
4 maintain a portion of the spent fuel cooling.

5 And they need to do so even for years, as
6 we've heard, after the reactors on those locations become
7 decommissioned.

8 But at the same time, we're seeing great
9 deal of activity around the use of once through cooling
10 and the marine environment, whether it's the Point
11 current re-licensing debacle on that or the Riverkeeper
12 two decision, or the State of California Water Board's
13 decision to say that all once through cooling at costal
14 plants, including nuclear plants some point in the next
15 decade.

16 And so we'll be seeing a growing increase
17 in restrictions and limitations on the use of once
18 through cooling, which again, a portion of which would
19 still be, if I understand that correctly, needed for
20 cooling the spent fuel pools.

21 And so I'm wondering if, and where in your
22 work the fact that these impacts that could lead to
23 expedited transfer if it's required for your cooling and
24 it's taken away from you, this might force an expediting
25 of transfer at some of these costal locations.

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1 And where is that reflected in your study?
2 I'm not sure, but is the NRC going to attempt to preclude
3 any state, or even your sister agency the Federal EPA with
4 their Clean Water Act requirements from the eventual
5 abandonment or prohibition on once through cooling.

6 And how might this impact the expediting of
7 cask loading from those pools, because I haven't seen any
8 consideration of this issue in your slides or report.

9 MR. JONES: Yes, this is Steve Jones in the
10 Office of Nuclear Reactor Regulation. The amount of
11 once through cooling water that's used for spent fuel
12 pool cooling is really trivial compared to the amount
13 used for power generation and heat rejection for the
14 power cycle far less than one percent.

15 And it's really not within the scope of this
16 study or overall topic.

17 MR. WEISMAN: All right, so that you could
18 say that any impacts or changes in a once through cooling
19 regulation. Once through cooling was stopped at any of
20 these plants, it would have absolutely no effect on the
21 continued cooling of the pools.

22 MR. JONES: Right, that's predominantly
23 the power cycle cooling system, which is separate from
24 the safety related cooling system.

25 MS. UHLE: This is Jennifer Uhle. I would

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1 also like to add, I'm just not sure if this is clear to
2 the public, that there is no water that gets released
3 that's come in contact with either the spent fuel pool,
4 fuel itself, with the spent fuel pool water or the reactor
5 side.

6 There's always a separation between the
7 contaminated water and the ultimate heat sink or the
8 water that can be taken in from the ocean to cool the fuel
9 in either the reactor or the spent fuel pool. I'm not
10 sure if that was clear to people.

11 MR. WEISMAN: All right, well thank you for
12 that. If and when this less than one percent of water
13 is lost from this particular source, it will have
14 absolutely no impact on the abilities of the spent fuel
15 pool to maintain its temperature?

16 MS. UHLE: This is Jennifer again. I guess
17 I'm still a little confused maybe about what your
18 question is. I'm sorry if I'm --

19 MR. WEISMAN: If any amount of once through
20 cooling water, and again I've just heard, again I thought
21 it was maybe sized 25 percent, but one percent of the
22 stream of water that's taken in for once through cooling
23 is used to help maintain the temperature of the spent fuel
24 pool.

25 And as Mr. Jones says, it's about, he says

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1 it's less than one percent. So if that one percent is
2 lost, that one percent of water because a prohibition or
3 ban on once through cooling, the pool still remained
4 adequately temperature controlled minus that bit of
5 water that's needed from the once through cooling source.

6 MR. SHERON: This is Brian Sheron. One
7 thing you have to remember is that even if you, you know,
8 I think what you're postulating is that somehow that some
9 government agency would ban the use of once through
10 cooling at these plants.

11 I don't really think that's a valid
12 assumption that someone would just automatically ban
13 that. But that said, regardless, even if some utility
14 were to move fuel expeditiously, there would still have
15 to be fuel that was left in the pool, and would require
16 cooling.

17 MR. WEISMAN: Correct.

18 MR. SHERON: You can't move all of the fuel
19 into dry casks. So it's strictly you're just removing
20 a very small percentage. And what you're actually
21 removing into dry casks is already very, very low power
22 and requires very, very little heat removal. So I don't
23 really think it has much of an effect.

24 MR. WEISMAN: Well no, and I'm assuming
25 it's not. That's what I just want to verify with, again,

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1 what Mr. Jones said is that less than one percent of the
2 water coming in through the massive once through cooling
3 is actually diverted or used or flows in a way that it
4 helps keep those pools cool.

5 So therefore, even if a state were, and by
6 the way Mr. Sheron, the State of California's law
7 actually does say that our once through cooling is
8 prohibited effective 2022 and 2024 in the State of
9 California for nuclear power plants.

10 And they're building cooling towers and
11 alternatives, so the state law can dictate that. But
12 what I'm hearing, though, is that if we loose that one
13 percent of water, doesn't matter. The pools will remain
14 cool, it was maybe just over the top protection
15 nonetheless. That's all I want to verify.

16 MS. UHLE: This is Jennifer Uhle again.
17 Yes, we don't see that as being a large impact.

18 MR. WEISMAN: Okay. That's just what I
19 wanted to make sure. Well thank you. That's my
20 questions for today.

21 MS. UHLE: Thank you.

22 MR. RAKOVAN: Thank you, sir. Okay, let's
23 go ahead and go to Tom Cochran followed by Kyle
24 Landis-Marinello and then third, Mary Lampert.

25 MR. COCHRAN: I'm Tom Cochran. I'm a

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1 consultant to NRDC. I used to head the nuclear program
2 at Natural Resources Defense Council, NRDC. I grew up
3 in the public school systems in Tennessee, so I may
4 butcher some of your names. I apologize for that up
5 front.

6 I'm trying to get my hands around the
7 overall study, and I would like to start with Dr. Uhle.
8 This process we're going through is what you and I and
9 in the trade refer to risk informed regulation building
10 or assessment.

11 And so part of your role in this study is
12 to judge the quantitative risks from these calculations
13 against the agency standards, which are the, as I
14 understand it, the principal quantitative safety goals.

15 So we're here primarily to see if we are
16 meeting the principal quantitative safety goals of the
17 NRC. Now, I'm wondering if it troubles you as it does
18 me that the Fukushima accident, all three reactors that
19 melted plus the fourth one, met the NRC's quantitative
20 safety goals.

21 Does that trouble you in making judgments
22 about how safe we're going to make these pools that you're
23 doing a assessment against some goals that were actually
24 met by the reactors that melted down in Japan and caused
25 such a disaster.

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1 MS. UHLE: This is Jennifer Uhle from NRR.
2 And let me try to go back for some people that might not
3 be as familiar with the term quantitative health
4 objectives. This was back in the, I believe, '80s or
5 '90s, the Commission wanted to define what was considered
6 to be safe enough.

7 And at the time, we were improving our use
8 and the accuracy of our probabilistic risk assessment
9 tools that first really started to be used in the '80s
10 time frame. And the Commission indicated that they had
11 safety goals on nuclear reactor -- can we hold off and
12 allow him more time as I give this more lengthy response?

13 MR. RAKOVAN: Go ahead.

14 MS. UHLE: Thank you, if that's what's
15 causing the problem, because I think this is important.
16 The quantitative, or excuse me, the safety goals, the
17 Commission said that by the operation of the nuclear
18 power, that what was considered to be safe enough was to
19 ensure that risk due to latent cancer fatality was less
20 than .1 percent of the cancer risk that is seen in today's
21 society.

22 And that .1 percent of the summation of all
23 the cancer risk, it really corresponds to a latent cancer
24 fatality risk of two in a million years. They also said
25 from prompt fatalities, or in the case of acute radiation

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1 exposure after an accident, that it would also be less
2 than .1 percent of normal accidental risk in today's
3 society.

4 And that equated to five in every 10 million
5 years. Okay, so those are very low frequencies that
6 would be an acceptable risk to the public from nuclear
7 power. And so what that equates to is that the
8 Commission said this is safe enough.

9 So when we look at our regulatory process,
10 once we've made a licensing decision and plants are
11 operating, we have certain restriction imposed on us by
12 federal regulation that we have to meet certain standards
13 before we make a licensing change, either the way they're
14 operating or their plant, and it's called backfit.

15 If people are interested, the actual
16 regulation is 10 CFR 50.109. Now, if we feel that it's
17 necessary for adequate protection, we can immediately
18 make the regulatory requirement come into play.

19 So when we look at changing our regulations,
20 we keep these figures of merit in mind. And with that,
21 the surrogate that we use to see if a particular plant
22 is acceptably safe is we go for a core damage frequency
23 of less than E2, or excuse me, one in every 10,000 years.
24 And Fukushima did not meet that.

25 They had an accident. They had three cores

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1 melted. They had --

2 MR. COCHRAN: Quantitative safety goals.
3 There were no prompt fatalities at Fukushima, right?

4 MS. UHLE: Okay, I'm --

5 MR. COCHRAN: Latent fatalities. If you
6 were less than 200 fatalities per million people, you met
7 the quantitative safety goals in Japan.

8 MS. UHLE: But in looking at the actual
9 plant design, that plant would have been required to have
10 been backfit from their seismic risk and their tsunami
11 risk here in the United States.

12 And the Japanese have recognized that, and
13 they are taking action to augment their tsunami and their
14 seismic risk at the plants in Japan.

15 Now, I agree with you the concept that there
16 thankfully were no prompt fatalities and the expected
17 latent cancer fatality results are extremely expected to
18 be low for the Fukushima because they did effective
19 evacuation.

20 So I think that actually shows the defense
21 in depth of the regulatory process in Japan, and then also
22 in the United States. That again, we make sure that
23 there are emergency preparedness mechanisms in place to
24 provide those measures in case they're called upon.

25 So the commission is currently looking at

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1 economic consequences, which include I think your point
2 about land contamination. At this stage, we do consider
3 the land contamination in our regulatory analyses. And
4 that is explicitly called out in the Tier 3 activity that
5 will shortly be public.

6 So land contamination is considered. And
7 at this stage, we are still seeing that with our current
8 estimates that we would not be meeting the threshold that
9 would warrant regulatory action.

10 Nonetheless, we are taking numerous actions
11 post-Fukushima, and requiring a number of enhancement
12 measures to augment the safety of our power plants here.

13 And it's been obviously discussed very
14 publically, and there's plenty of public meetings
15 including mitigating strategies is under discussion,
16 spent fuel pool instrumentation, improving severe
17 accident management guidelines, et cetera. So we are
18 taking action to enhance the safety of our plants here.

19 MR. COCHRAN: Brian, do you agree with me,
20 that Fukushima accidents met the NRC's principal
21 quantitative safety goals? That's a simple yes or no.
22 Or I don't know.

23 MR. SHERON: Well, I haven't done the exact
24 calculation, but I think the answer is most likely yes,
25 they did meet the safety goals.

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1 MR. COCHRAN: I would like to turn to Mr.
2 Esmaili. The study that you co-authored, just to
3 simplify it for my purposes, you start with an earthquake
4 risk of one in 60,000.

5 Your analysis says the probability of a
6 fire, well you're not going to get a fire unless it's
7 within the first two months after refueling. So the
8 probability is being knocked down by roughly another
9 order of magnitude.

10 MR. ESMAILI: Correct.

11 MR. COCHRAN: And that the probability of
12 getting a major release is yet another order of magnitude
13 below that because of the probability associated with
14 whether the pool drains or not.

15 Only in ten percent of your earthquake cases
16 did you get drainage of the pool, you don't have a release
17 unless you get drainage. So it's one in 6,000 times ten
18 percent times ten percent.

19 So it's essentially a probability of a large
20 release from your studied case of one in six million.
21 Now 60,000 times ten times 100, 600,000, 6 million. One
22 in six million. Okay?

23 MR. ESMAILI: This is --

24 MR. COCHRAN: Just in round numbers.
25 We're in that neighborhood.

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1 MR. ESMAILI: This is Hossein. I guess
2 this time I remembered my name. Yes, approximately.
3 Yes, we start out with --

4 MR. COCHRAN: Just approximate.

5 MR. ESMAILI: Yes. Ten percent
6 probability of liner damage that can lead to a release,
7 a ten percent probability, approximately.

8 MR. COCHRAN: Yes, approximately. I'm
9 doing a back of the envelope, back of the mine calculation
10 to make sure I understand. And so we have 100 reactors,
11 let's just make life simple, 60 years, maybe half of their
12 lives to go, so 30 years.

13 So there's 3,000 reactor years to go. One
14 in 6,000 for 3,000 reactor years, you wouldn't expect
15 this even to occur under your study --

16 MR. RAKOVAN: Tom, can you speak into the
17 microphone please so we can pick you up?

18 MR. COCHRAN: -- by the order of once in
19 3,000 years?

20 MR. RAKOVAN: Can you speak into the
21 microphone so we can make sure we pick you up?

22 MR. COCHRAN: Yes.

23 MR. RAKOVAN: Thanks.

24 MR. COCHRAN: Once in a few thousand years,
25 I mean, that's the bottom line of this study. So I want

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1 to ask you do you believe that your study bounds the risks
2 associated with a spent fuel pool release going forward?
3 You've done a quantitative?

4 Does your study in your mind, in your
5 technical mind, you know what these guys have done and
6 you know what you've done, is it your view that you've
7 bounded the risk to the public by the study you've
8 conducted.

9 MR. ESMAILI: This is Hossein again. The
10 study was a consequence study. It was not a
11 probabilistic risk. We put in this probabilistic
12 considerations as you correctly point out, that it was
13 one in 60,000 years, right?

14 There's a ten percent probability of liner
15 failure and there's a ten percent probability of --

16 MR. COCHRAN: Something, yes.

17 MR. ESMAILI: Yes, so we get that. But
18 this shows the probability that something can happen,
19 right? It was never meant to be a bounding analysis. It
20 was a best estimate analysis.

21 What probability tells you is that, you
22 know, something can happen and that this is certain
23 probability. It doesn't tell you when it's going to
24 happen. So --

25 MR. COCHRAN: So you do not believe --

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1 MR. ESMAILI: It was not a PRA, it was not
2 a probabilistic risk assessment. Yes.

3 MR. COCHRAN: So authors of the study, I
4 understand what you just told me, do not believe this is
5 a bounding calculation of risk from an earthquake induced
6 spent fuel fire in the pool?

7 MS. UHLE: I'm --

8 MR. COCHRAN: I'm asking him, I'm not
9 asking you. I'm asking the technical guy that wrote the
10 study.

11 MS. UHLE: Excuse me, we're trying to
12 answer the questions for the benefit of the public. So
13 --

14 MR. COCHRAN: Then let him answer, and then
15 you answer.

16 MS. UHLE: No, actually I have the right as
17 a member of the United States Nuclear Regulatory
18 Commission --

19 MR. COCHRAN: Okay.

20 MS. UHLE: -- to answer the question
21 because I think --

22 MR. COCHRAN: Keep track of the tack.

23 MR. RAKOVAN: We've been --

24 MS. UHLE: The study that was done in the
25 Office of Research, I was a member of the Office of

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1 Research, I was its deputy director when it was first
2 initiated.

3 So that was a best estimate study for us to
4 understand what the most likely consequences would be.
5 But we are not just using that study to determine whether
6 if we're going to take any regulatory action. So the study
7 --

8 MR. COCHRAN: I know that. I heard your
9 earlier testimony.

10 MR. RAKOVAN: Can you let her finish
11 please, Mr. Cochran?

12 MS. UHLE: Thanks. So the study doesn't
13 need to be bounded. We wanted to best understand what
14 we think the most likely results would be.

15 The way we then looked to see other
16 variations, including other reactor designs, et cetera,
17 is by the regulatory analyses and making conservative
18 assumptions that are described in the spent fuel pool
19 study in Appendix D.

20 And we also have done so to broaden it to
21 the other plant cases in the Tier 3 analysis, which will
22 be publically available here shortly.

23 MR. RAKOVAN: Do you have one more
24 question, Mr. Cochran?

25 MR. COCHRAN: No, I don't. And I want to

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1 get credit for the time I've lost.

2 MR. RAKOVAN: You've got credit for the
3 time you lost, Mr. Cochran.

4 MR. COCHRAN: All right.

5 MR. RAKOVAN: Do you have one last
6 question?

7 MR. COCHRAN: No, I have more than one last
8 question.

9 MR. RAKOVAN: Can you have one last
10 question, please and be done?

11 MR. COCHRAN: No, I cannot. I can come
12 back?

13 MR. RAKOVAN: Then we'll have to take a
14 recess. Do you have one last question, please? I'm
15 trying to get to a couple dozen other people by my clock.

16 MR. COCHRAN: I'm fine with that.

17 MR. RAKOVAN: Okay.

18 MR. COCHRAN: You asked me if I had one last
19 question. The answer is no.

20 MR. RAKOVAN: I apologize.

21 MR. COCHRAN: I have several more
22 questions.

23 MR. RAKOVAN: I should have been more
24 precise.

25 MR. COCHRAN: I will ask one more question,

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1 and then we will go on to other people.

2 MR. RAKOVAN: Thank you.

3 MR. COCHRAN: And hopefully you will allow
4 me to come back.

5 MR. RAKOVAN: If we have the time.

6 MR. COCHRAN: Here's my problem. I take
7 your number of ballpark number, one in six million for
8 having a substantial release. And I look at, say we got
9 3,000 more reactor years of operation of the fleet.

10 So that's, you know, the probability of this
11 event is one in 2,000, one in a few thousand, one in a
12 couple thousand, something like that per year. So I then
13 ask myself about the security challenge that you didn't
14 address.

15 And I say what is the probability that you
16 would get a security breach that would cause the same
17 accident, and it's a joint probability of the probability
18 that someone wants to do it times the probability of their
19 success in doing it.

20 And I would assume that if someone was going
21 to challenge the reactor, they would have sense enough
22 to do it within right after a refueling, and they would
23 pick their reactor and pick the time.

24 And therefore, I have come to the conclusion
25 that the probability of getting into this scenario that

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1 we don't want to happen is much higher through some sort
2 of successful terrorist event or whatever, which is not
3 part of your study.

4 So my question is in the security analysis
5 of these reactors, do you look at the benefits of
6 expediting spent fuel removal to reduce the consequences
7 associated with a successful attack on a spent fuel pool.

8 MS. UHLE: This is Jennifer Uhle from NRR,
9 and the answer to that is no, not explicitly. After the
10 attacks on September 11th, we did a number of analyses
11 looking at aircraft impact.

12 And we did take some regulatory action,
13 including the requirement of having what we called
14 emergency strategies. They're now incorporated into
15 the regulations there.

16 I don't know if many people have heard the
17 term B.5.b, that came out of the order. But there were
18 a number of actions such as including emergency power and
19 pumping and ensuring the water supplies.

20 During those analysis, we did not do the
21 comparison between, you know, the high density loading
22 and the low density loading. We can't get into a great
23 deal about what we did do in those studies, they're not
24 publically available.

25 We have a robust security measures in place

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1 at the reactors. And we feel that the security threats
2 at a reactor are appropriately considered in other parts
3 of our regulatory program. So the answer to you is no,
4 we did not do that, but we believe the reactors are safe
5 from a security perspective.

6 MR. COCHRAN: But it's a higher risk.
7 Well, I'll come back later.

8 MR. RAKOVAN: Okay, thank you. Okay, next
9 on the list I had Kyle Landis-Marinello? Kyle, if you're
10 on the phone lines and you wish to make a comment, can
11 you identify yourself at this point so the operator can
12 unmute your line?

13 OPERATOR: Thank you. And once again,
14 that's Star 1.

15 MR. LANDIS-MARINELLO: Hello.

16 OPERATOR: And your line is now open.
17 Thank you.

18 MR. LANDIS-MARINELLO: Hi, can you hear me
19 now?

20 MR. RAKOVAN: Yes, we can. Go ahead sir.

21 MR. LANDIS-MARINELLO: Great. This is
22 Kyle Landis-Marinello from the Vermont Attorney
23 General's office. Thank you for holding this
24 conference. And it's been very informative.

25 I've been learning a lot just listening in.

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1 And one thing that struck me is there seems to actually
2 be a fair amount of agreement on some of the issues here.

3 And I think I heard Dr. Uhle say that the
4 NRC staff assumed that there's no risk posed by dry casks.
5 And so there is some level of incremental risk with
6 leaving it in the pools.

7 But it sounds like the NRC staff is
8 constrained by the backfitting provision in 10 CFR
9 50.109, and that that prevents the NRC from doing the
10 safer option of requiring expedited movement to dry
11 casks.

12 And I wondered if the NRC staff looked at
13 some of the exceptions in that backfitting rule, for
14 instance redefining the level of protection that's
15 required. Or just more generally whether this actually
16 is a backfit.

17 Some of the rules talk about, the whole rule
18 seems to be what you build your plant under certain regs,
19 and you should be able to count on those regs. And so
20 there's a higher standard you need to show a substantial
21 increase in safety before you need to backfit a plan.

22 It strikes me as a bit of an odd word to use
23 a backfit for where we are now because we're someplace
24 where we never thought we would be at these plants in that
25 the idea, when this backfit provision came about, was

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1 that plants wouldn't be storing fuel, that it would go
2 somewhere else.

3 And now a lot of fuel is being stored at
4 these plants. And so is there room for looking at
5 whether this actually is a backfit?

6 MS. UHLE: Hi, thanks for your comment.
7 This is Jennifer Uhle. And if the agency felt that
8 adequate protection was not provided by the plants, and
9 you can read in 5109, we would again take immediate action
10 to ensure public health and safety.

11 So if you're looking at the exception to the
12 backfit rule, one is that it's adequate protection. And
13 we've promulgated a number of rules based on adequate
14 protection.

15 And then another one is if we want to
16 redefine, you know, what the level of adequate protection
17 entails. And in those is, again, looking at the risk
18 posed to the public as some measure, also defense and
19 depth, what have you.

20 But just to give you an idea of the risks
21 associated with the high density storage with, you know,
22 the current configuration of spent fuel, we computed the
23 latent cancer fatality and it ranged, of course.

24 But looking at because of the different
25 designs when we did the regulatory analysis with the Tier

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1 3 work, again you haven't seen that publicly yet. It will
2 be coming out the end of September.

3 And the latent cancer fatality risk is, I'm
4 going to use the term E^{-10} , which means one every, what
5 is it, something to do with one every, no it's more than
6 that, 10 billion years.

7 So that is, in our mind, so low that it
8 doesn't rise to the level of adequate protection. But
9 we have, and we continue, to assess whether or not we need
10 to redefine adequate protection and whether or not
11 adequate protection, we need to do rulemaking.

12 And in fact, we have rulemakings underway.
13 And orders were issued after Fukushima that did point to
14 an adequate protection reason for a number of actions
15 post-Fukushima.

16 MR. LANDIS-MARINELLO: Okay. And I guess
17 it's just kind of from a gut level perspective, even if
18 it seems like a very small number, it's hard to understand
19 why they're not required this measure, particularly
20 when, and I was a little confused by the cost/benefit
21 analysis because I'm assuming that there are two things
22 that weren't taken into account and maybe you can comment
23 on this.

24 One is a lot of these plants need to move
25 this fuel into dry casks in order to transport the fuel

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1 away at some point. And so the cost of doing it now
2 versus later is actually pretty minimal.

3 And then the second factor is whether the
4 plants are actually, there's a huge number for what they
5 would cost the plants.

6 But under the law right now as the courts
7 have defined it that arguably the plants aren't paying
8 anything moving the fuel to dry casks because legally
9 that falls upon the DOE for its breach of contract. So
10 should the cost analysis be redone

11 MS. UHLE: Again, this is Jennifer Uhle
12 from NRR. We had a long conversation. I was just
13 wondering if you can go back just so we clearly understand
14 your questions, and then we'll, I think Fred Schofer from
15 the Office of Nuclear Reactor Regulation who did the reg
16 analysis can answer your question.

17 But at this stage, we could benefit by you
18 repeating your question, if you don't mind.

19 MR. LANDIS-MARINELLO: Sure. When you
20 looked at the cost to this plant of immediately moving
21 fuel that can be moved into dry casks, I wonder if you
22 considered that a lot of the fuel has to be moved in order
23 to be transported to -- or another storage facility at
24 some point, and so the cost is actually pretty minimal
25 when that's the case.

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1 And I also wondered if you looked at whether
2 there actually is any cost, given that the state of the
3 base law that's come down from the federal circuit has
4 said that the Department of Energy is responsible for all
5 those costs. So there's arguably no cost to the reactor
6 operators to move the fuel.

7 MR. SCHOFER: Hello, this is Fred Schofer,
8 Office of NRR. With regard to the costs for moving the
9 spent fuel into casks, what the regulatory analysis did,
10 and that's attached to the spent fuel pool study in
11 Appendix D, is look at the incremental costs between
12 doing the expeditious movement within, you know, between
13 2014 and 2019 and then maintaining the low density
14 storage configuration in the pool until end of operation,
15 and then moving the remaining fuel into dry storage five
16 years hence against the current, you know, regulatory
17 baseline which is moving fuel into dry cask storage as
18 to maintain your one core empty inventory in the pool,
19 and until end of your operating license and then moving
20 the remaining fuel into dry cask storage ten years hence.

21 So those incremental costs were calculated
22 and reported in that appendix.

23 MR. LANDIS-MARINELLO: Okay. And it was
24 assumed all the costs would fall on the reactor
25 operators?

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1 MR. SCHOFFER: It was reported as an
2 industry implementation cost, that is correct.

3 MR. LANDIS-MARINELLO: Okay, thank you.

4 MR. RAKOVAN: Is that the extent of your
5 questions, sir?

6 MR. LANDIS-MARINELLO: Yes, that's it.
7 Thank you very much.

8 MR. RAKOVAN: Okay, very good. We'll go
9 ahead and move now to Mary Lampert, then we'll go to Linda
10 Seeley and third, Tom Rielly. Mary, are you on the line?
11 Operator, can you check to see if Mary Lampert is on the
12 line, please? Are we on the line? Okay, we're on the
13 line.

14 Operator, are you there please? Okay.
15 Should we take a five minute stretch break? See if we
16 can make sure that we're on the line and that we have an
17 operator with us. Okay, five minutes? All right, five
18 minute break.

19 (Whereupon, the foregoing matter went off
20 the record at 2:05 p.m. and went back on the record at
21 2:11 p.m.)

22 MR. RAKOVAN: Okay, I'm going to go back to
23 the list as I had it. I'm starting with Mary Lampert.
24 Mary, if you are on the line, if you could identify
25 yourself so that the operator could bring you in. And

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1 Brooke, if Mary doesn't identify herself we'll go ahead
2 and move on to the next person.

3 OPERATOR: Absolutely. And that is Star
4 1, please.

5 MS. LAMPERT: Hello.

6 OPERATOR: And your line is open, thank
7 you.

8 MS. LAMPERT: Hello, can you hear me?

9 MR. RAKOVAN: You could be a bit louder, but
10 yes we can hear you Mary.

11 MS. LAMPERT: Okay. First I'll start off
12 with that Pilgrim Watch believes this is not a credible
13 study. And while the study pretends to be a broad
14 scientific study into pool fires, instead it narrowly
15 looks at just earthquakes, avoiding important pool fire
16 accident contributors, and avoiding the evaluation of
17 all mitigation strategies.

18 My first point of discussion is that I
19 believe that it's premature to release the study for two
20 reasons. First, the National Academy of Sciences was
21 called in by the Congress to determine the adequacy of
22 NRC's safety regulations in light of the ongoing
23 Fukushima disaster.

24 The specific emphasis on the advisability
25 of current spent nuclear fuel pool practices at our

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1 reactors. So it seems to me that both members of
2 Congress and the NRC itself should halt the fast moving
3 train you're on relative to its continuing approval of
4 high density spent nuclear fuel pool storage until the
5 Academy has finished its quality assurance review.

6 Second, the analysis was done using a MELCOR
7 code that has assumptions and methodology that go back
8 before Fukushima to judge a post-Fukushima situation.

9 For example, some of the weaknesses in the
10 code would include the economic consequences of not
11 accurately assessing cleanup as discussed by the New York
12 State in the Indian Point adjudication process for
13 relicensing. Also, you could consider emergency
14 planning.

15 The assumptions there are number one, there
16 are offsite emergency plans. But we have seen, for
17 example, in the Oconee experience that after a year and
18 a half, offsite emergency planning is no longer required,
19 however the spent fuel is still an issue at the site.

20 So without offsite planning, there's no way
21 you can make an assumption that folks are going to get
22 out of dodge in a timely manner. Nor can you assume that
23 the evacuation time estimates done by KLD are correct
24 because, for example, much of their methodology relies
25 on telephone surveys that do not ask or tell that this

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1 is for a radiological disaster.

2 And there are multiple problems with those
3 estimates. So bottom line what I'm saying is you're
4 going about this in a backwards manner.

5 You're coming to a conclusion that fuel
6 storage in a densely packed open train design is safe
7 based on a weak study as opposed to waiting for the
8 National Academy of Sciences report and waiting until you
9 deal with updating the consequence analysis code of the
10 MELCOR.

11 That also what you could have commented on.
12 But bottom line to me is which is safer, spent fuels that
13 are densely packed with a closed frame design, or dry
14 casks? Although that was not a primary focus in your
15 study, it is clear from reading parts of this study that
16 clearly dry casks are safer.

17 The study says that a fire in a spent fuel
18 pool in this limited study at Peach Bottom could
19 contaminate thousands of square miles with radioactive
20 material, forcing long term displacement of millions of
21 people and cause tens of thousands of cancer deaths.

22 The National Academy of Sciences prior
23 found serious consequences expanding over 100 miles of
24 a spent fuel pool fire. The Massachusetts Attorney
25 General found a spent fuel fire at Pilgrim would result

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1 in, could \$488 billion of damages and 24,000 latent
2 cancers.

3 So it seems clear that if NRC is to achieve
4 compliance with its statutory requirement to protect
5 public health and safety, that you have already decided
6 that dry cask storage is far safer, which would allow a
7 backfit.

8 Do you dispute that the study indicates dry
9 cask storage is safer? Do you dispute that NRC is
10 statutorily required to protect public health and
11 safety?

12 And do you dispute if you decide the public
13 health and safety are better off with dry cask storage,
14 that you will have the capability to do so?

15 MS. UHLE: Hi, this is Jennifer Uhle from
16 NRR. So thank you for your comments. Your particular
17 comment about whether the agency should wait on decision
18 making until after the National Academies has completed
19 its work, we'll take that under consideration.

20 The three points, questions that you
21 summarized at the end of your statement there, yes it is
22 our statutory requirement to ensure public health and
23 safety. That is our mission.

24 We don't agree with your view that the study
25 done, the spent fuel pool study done by the Office of

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1 Research shows that dry cask is safer. And it did not
2 really analyze the safety of dry casks.

3 The way we handled that is in our regulatory
4 analysis that enters into our decision making. It
5 guides how we make decisions here at the agency.

6 We assumed that there was no risk posed by
7 dry casks so that when we did a comparison to the low
8 density, high density with the low density having the
9 additional casks loaded, that enhanced the safety
10 increase that would occur with the low density.
11 Nonetheless, that safety increase did not --

12 (Simultaneous speaking.)

13 MS. UHLE: I'm sorry, can I just try to
14 finish because I think there's probably other people on
15 the line that would be interested in just me closing out
16 my comment here, or my response to your question.

17 So our conclusion is not that dry casks are
18 safer. That wasn't studied. But we did do a
19 conservative estimate to maximize the safety benefit of
20 going to the low density loading for the sole purpose of
21 bounding that case.

22 And nonetheless, we showed that, from our
23 conclusions on the spent fuel pool study which focused
24 on Peach Bottom, that there was not an adequate increase
25 in safety to warrant regulatory action.

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1 MS. LAMPERT: Well, it seems to me you're
2 talking in circles. First, you assumed that there was
3 no risk to dry casks, so I will take that at face value.

4 MS. UHLE: We did so in the study to
5 facilitate the regulatory analysis. We were not
6 assessing the safety of dry cask storage.

7 MS. LAMPERT: Well then before you move
8 forward, this would be another point, it only makes sense
9 for an assessment and comparison of which is safer
10 because safety is your job.

11 MS. UHLE: Okay, thank you for your
12 comments.

13 MR. RAKOVAN: Mary, did you have any
14 further questions.

15 MS. LAMPERT: I think I'll move forward. Or
16 can I cede the remainder of my time?

17 MR. RAKOVAN: I would rather that you
18 either ask a question or we move on to the next speaker.
19 I have quite a few who have signed up.

20 MS. LAMPERT: Do you have a preference.
21 The question was may I cede the remainder?

22 MR. RAKOVAN: We typically don't allow
23 that.

24 MS. LAMPERT: Okay, I'll let it move on.
25 Thank you.

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1 MR. RAKOVAN: Thank you. Okay, let's go to
2 Linda Seeley, then Tom Rielly, and third either Diane
3 D'Arrigo or Tim Judson. Ms. Seeley, are you on the line?
4 Can you identify yourself, please?

5 OPERATOR: And once again, that is Star 1.
6 And Ms. Seeley, your line is open.

7 MS. SEELEY: Thank you. Hello?

8 MR. RAKOVAN: Yes, go ahead please.

9 MS. SEELEY: Okay. Good afternoon, or
10 good morning depending on where you are. I have two
11 quick questions. The first question is about high
12 burnup fuel.

13 And I would like to know what percentage of
14 the spent fuel that's stored right now around the nation
15 is high burnup fuel?

16 MR. ESMAILI: This is Hossein. I just
17 don't know the answer. Do you? We can look it up.

18 MS. UHLE: Yes, we would have to get back
19 to you on the specific percentage.

20 MS. SEELEY: Is it a good, I mean, is it a
21 notable amount of the spent fuel? Or is it a minuscule
22 amount?

23 MS. UHLE: I would say it's probably
24 roughly half at this stage, but that's my personal
25 estimate. This is Jennifer Uhle. So I do want to get

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1 back to you with a very accurate answer.

2 MS. SEELEY: Okay. Number two then, from
3 what I've read, high burnup fuel has to stay in the pools
4 longer because it's hotter. Is that correct?

5 MR. ESMAILI: Yes. High burnup is higher
6 decay, correct. This is Hossein.

7 MS. SEELEY: That is correct. How long
8 does it have to stay in?

9 MR. ESMAILI: Well, there is no regulatory
10 requirement on when we move things out of the pool, right?
11 There is some constraint on the thermal, you know,
12 shielding of the casks.

13 But typically, you know, fuel that is older
14 than five years, that is younger than five years cannot
15 be moved to a cask without substantial penalty on the
16 number of assemblies that can be put into the cask. By
17 the way --

18 MS. SEELEY: Is that the -- what? I'm
19 sorry.

20 MR. ESMAILI: Yes, I'm done.

21 MS. SEELEY: Okay. So five years for
22 either high burnup or, what is the other kind called,
23 normal or regular fuel, or low burnup?

24 MS. UHLE: Jennifer Uhle at NRR. Yes, we
25 just call it low burnup versus high burnup.

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1 MS. SEELEY: Okay. Okay, so both have to
2 stay in the spent fuel pools the same amount of time even
3 though the high burnup is hotter, but they just can put
4 fewer rods into a dry cask? Is that what I'm hearing?

5 MS. UHLE: This is Jennifer Uhle from NRR.
6 Yes, the difference between the low burnup and the high
7 burnup in terms of decay heat is really not that dramatic.
8 The regulatory concern about high burnup is whether or
9 not the cladding in material properties are less robust.

10 But in general, the fact that the low burnup
11 fuel stays in the core for, you know, quite a bit of time
12 and is getting burned, it's really not that much
13 different in its decay heat levels compared to the high
14 burnup fuel. There may be ten percent or something like
15 that.

16 MS. SEELEY: I see. So then it's about the
17 cladding and the robustness of the cladding. And so when
18 you move the high burnup fuel out of the casks into dry
19 cask storage, would there be greater concern about the
20 cladding, cracks in the cladding or something like that?
21 Do they have to use special equipment for that?

22 MS. UHLE: This is Jennifer Uhle again.
23 No, the concern about the material properties of high
24 burnup fuel are only during an accident scenario that we
25 require licensees to be able to mitigate.

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1 And that is called a loss of coolant
2 accident. And so the material properties are fine for
3 movement. It's into the spent fuel pool, the regulatory
4 concern is a loss of coolant accident in the core.

5 We are doing some experimental work to also
6 look at for transportation, the impact of high burnup
7 fuel. And to date, we do not see a safety concern there,
8 either.

9 MS. SEELEY: Okay. Thank you. Okay, so
10 now this study that you did was based, it was a response
11 to the Fukushima catastrophe, correct? The Tier 3
12 study, right?

13 MR. SHERON: This is Brian Sheron. The
14 spent fuel pool study was done just subsequent to the
15 Fukushima accident in anticipation that our commission
16 would be asked questions about the expedited transfer of
17 spent fuel.

18 MS. SEELEY: Right. So what I think is
19 puzzling to me is that the Fukushima catastrophe isn't
20 over yet. And they don't know how to get the spent fuel
21 out of those spent fuel pools, right? They haven't
22 figured it out there. In fact, nobody in the world knows
23 how to do it, correct?

24 MR. JONES: This is Steve Jones in NRR.
25 There are plans. My last understanding was that the Unit

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1 4 spent fuel would begin removal in the next year or so.
2 So I mean, there are plans underway to get the fuel out
3 of the spent fuel pools. It is located high in the
4 buildings, and it is accessible.

5 MS. SEELEY: I know they have plans to do
6 it. They're trying to figure out how to do it. But from
7 what I understand, the rods are not straight up and down,
8 they're kind of askew and they've never tried to do
9 something like this before in the history of the world.
10 So I'm just --

11 MR. JONES: Well, this is --

12 MS. SEELEY: -- astounded, frankly, that
13 you could reach the conclusions that you've reached
14 without actually seeing what happens at Fukushima.

15 And you know, during this whole process
16 that's going on, I would ask you because I'm a member of
17 the public and I'm a very concerned member of the public
18 and I would ask you, as my regulator and as my protector
19 in this world, I would ask you to hold your horses a little
20 bit and give yourselves some time before you come to these
21 conclusions like it doesn't really make any difference
22 whether you move the rods out of the spent fuel pools or
23 not.

24 To any sensible person who is not an
25 engineer, that is an absolutely ridiculous assumption

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1 that you're making, frankly, because at Fukushima the dry
2 casks were safe.

3 At Fukushima the spent fuel pools are a
4 total mystery about how they're going to take care of
5 them. We all know that. And you have done this
6 analysis, the mathematical analysis to tell us that it's
7 all okay.

8 But frankly it's not okay. And you're not
9 doing your job as a regulator and as a protector of me
10 and my family and the rest of the people who live near
11 nuclear reactors in this country.

12 And I'm quite disappointed in you. I
13 thought we could expect more. That's about all I have
14 to say. Thank you.

15 MR. RAKOVAN: Okay, let's go ahead and move
16 on to the next caller. Tom Rielly followed by Diane
17 D'Arrigo or Tim Judson. And then Rochelle Becker. Mr.
18 Rielly, if you're on the line please?

19 OPERATOR: And once again, that's Star 1.
20 And your line has been opened, thank you.

21 MR. RIELLY: Good afternoon, this is Tom
22 Rielly. Thank you for the opportunity to comment and to
23 make a request or a suggestion during the public meeting
24 covering the scope and range of important nuclear subject
25 matter.

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1 As I stated, my name is Tom Rielly. I'm the
2 executive principal of Vista 360, which is based in the
3 Chicago area. We're an Illinois non-profit public
4 interest leadership group composed of scientists,
5 engineers, business executives and some academics.

6 We're an imbedded expert volunteer
7 organization. We unilaterally engage matters that
8 impact or potentially impact the public who are in many
9 cases uninformed or misinformed in their busy lives.

10 Illinois, as you know, is a state with
11 presently 14 reactors and approximately 9,000 tons of
12 nuclear waste, and is also the location of the presently
13 in progress Zion Nuclear Power Station Decommissioning
14 and Site Restoration Project.

15 The Zion Nuclear Decommissioning and Site
16 Restoration Project will be the largest project of its
17 type in U.S. nuclear history. It started in 2010 and
18 will presumably end in 2020.

19 The decommissioning model is
20 unprecedented, as this decommissioning site and
21 restoration project is being undertaken with a licensed
22 transfer to a non-public utility employing a limited
23 liability company business structure.

24 It's a ten year multi-phased billion dollar
25 project drawing down rate peer trust funds in an intense

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1 financial environment without the right checks and
2 balances.

3 It's a complex undertaking, and due to the
4 project's tasks involving the transfer and on-site
5 storage of high level radioactive waste and spent fuel.

6 Presently, the Zion Decommissioning is at
7 a critical point of transferring over the next two years
8 spent fuel from a wet pool to some 60 odd licensed dry
9 casks. So this meeting is very germane, and I thank you,
10 we thank you for holding it and bringing this forth to
11 the public sector.

12 Regarding our comment or suggestion,
13 history dictates that the NRC, in its external
14 communication efforts, employs the terms stakeholder,
15 stakeholders and the public on a commingled basis.

16 Looking at the term stakeholder, we note
17 along with NRC assistance, that this term is not defined
18 in the NRC's lexicon, glossary, nor in the ADAMS system.

19 Our respectful request is that this
20 deficiency be corrected and the term stakeholder or
21 stakeholders be clearly defined. Thank you for this
22 opportunity, and best wishes in carrying out your stated
23 mission.

24 MR. RAKOVAN: Okay. Let's go ahead. If
25 Diane D'Arrigo or Tim Judson are on the line, if you could

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1 hit Star 1 please. Oh, okay. Wow, we have someone live
2 and in person in the room.

3 MR. JUDSON: Hi, I'm actually Tim Judson
4 and I'm taking the place of Diane D'Arrigo who wasn't able
5 to be here today. My name is Tim Judson, I'm the
6 Associate Director of the Nuclear Information and
7 Resource Service.

8 Also as background, for the last 15 years
9 prior to my current position, I was the president and I'm
10 a staff member of the Citizens Awareness Network, a
11 grassroots organization based in the Northeast, also
12 working on nuclear power issues.

13 I've been very engaged in the issue of spent
14 fuel safety and security for a very long time. I, you
15 know, want to acknowledge to some extent the difficult
16 position that the staffer in here to be receiving such
17 heavy criticism.

18 And without dwelling too much on that, you
19 know, I want to sort of go back and look at the record
20 and the trajectory of where NRC has been on this issue
21 for some time because I think it's relevant to where we
22 are today.

23 And you know, what's remarkable to me is how
24 far NRC's, you know, analyses and policies on this issue
25 are diverging from reality. And even diverging from

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1 NRC's own work on this in the past.

2 And I recall NRC's study from 1999, you
3 know, which in some senses was one of the first clearest
4 pictures of the risk that spent fuel pools, and spent fuel
5 pool accidents can have.

6 And that, in fact, has been the basis of a
7 lot of the independent work that's been done since that
8 time. And you know, that which came into very clear
9 focus, I think, for the public interest community after
10 9/11.

11 And so in the years after 9/11 this issue,
12 because of the way it came to light and it came into
13 people's consciousness was framed as a security issue
14 because it became very clear that the issue of what would
15 happen if someone caused an accident in a fuel pool
16 deliberately?

17 And that was where, you know, the initial
18 studies that were formed by the Alvarez team and then the
19 National Academy of Sciences began to look at this in that
20 context and concluded that the NRC's science in 1999 was
21 essentially correct.

22 But for some reason, since then the NRC has
23 consistently backed away from its own research on that
24 from that time. And what I remember very clearly is
25 after the Alvarez report came out, that the very clear

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1 directive from one of the commissioners to the staff was
2 to undermine the science that had been done that showed
3 the risk of spent fuel pool accidents.

4 In fact, I believe it was the late
5 Commissioner McGaffigan told the staff that he wanted
6 them to do a hard hitting critique that would undermine
7 this peer reviewed scientific study.

8 And that was in fact, you know, and NRC's
9 consistent position on the issue of spent fuel pool
10 safety has followed that trajectory ever since.

11 And so now we go from the NRC denying that
12 a deliberate attack on a spent fuel pool will likely cause
13 a major release of radiation to now having to look at what
14 happens if we stumble into an accident scenario like that
15 through a natural disaster.

16 And again, the NRC is consistently saying
17 that the public should go back to sleep and not have to
18 worry. And what I'm curious about is how, given that we
19 have a real situation, we have a real accident that
20 happened in Japan. And we're calling this, and you
21 acknowledge that this analysis was done in a
22 post-Fukushima regulatory process.

23 How do you do an analysis of the situation
24 that precludes the realities that we've actually
25 observed happen? I mean, as you say that one of the

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1 bounding assumptions within your analysis is that there
2 isn't a reactor accident happening at the same time.

3 And yet you're looking at a very large,
4 you're assuming a very large earthquake which could
5 potentially challenge a spent fuel pool, but at the same
6 time would also challenge the reactor.

7 And we've seen what happens at Fukushima,
8 you know, in that kind of a situation. And you know, as
9 the previous caller reminded us, the crisis at Fukushima
10 is not over.

11 I mean, aside from the question of the
12 technical ability to withdraw spent fuel rods from the
13 fuel pools and, you know, given the deformation of the
14 racks that are in those fuel pools, the structure itself
15 is compromised and they're trying to figure out a way to
16 prop up the fuel pool at Fukushima Unit 4 so that it
17 doesn't collapse before another earthquake happens.

18 And so the basic assumptions that have been
19 made here seem completely off base from reality. And
20 that's extremely troubling to the public. And so I
21 think, you know, another aspect of this is the choice of
22 Peach Bottom as the reference reactor for this analysis.

23 And what I've heard mentioned so far is that
24 partly, Peach Bottom was chosen as a matter of expedience
25 because you already had a lot of data on that reactor.

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1 But the NRC has already acknowledged that
2 there are other reactors that have a greater risk of, you
3 know, accident risk as a result of an earthquake, notably
4 the Pilgrim reactor in Massachusetts was, in the weeks
5 after Fukushima, cited by NRC as having the second
6 greatest risk of accident due to an earthquake, which is
7 also a Mark I boiling water reactor with a high density
8 fuel pool configuration.

9 So there's a question of why the NRC is
10 making the choices that they are in evaluating these
11 risks. And then another sort of interesting aspect of
12 what's come forth today was Mr. Witt's response to a
13 previous question about the issue of expediting the
14 transfer of fuel into dry casks, you know, even in advance
15 of the usual five year practice of keeping fuel in the
16 fuel pools before putting them into dry storage.

17 And he said that doing it at a three year
18 time frame would have been an unnecessary additional cost
19 to reactor operators. And it raised the question of, you
20 know, how much cost is too much for the industry in the
21 NRC's eyes.

22 I mean, I have, in my previous position,
23 tracked the use of dry cask storage at the Fitzpatrick
24 Reactor in New York State. And they load, I believe it's
25 six casks, or no, three casks every two years at that

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1 plant.

2 And that's older spent fuel that's past the
3 five year usual practice. So if a few extra casks needed
4 to be filled in order to reduce the risk, you know, to
5 get waste out of the pools as soon as possible, that's
6 only a few million dollars.

7 I mean, to the industry, that's a moderate
8 capital expense. And so in the NRC's views of what's too
9 high of a regulatory burden for the licensees, how much
10 cost is too much, you know, versus the safety that the
11 public deserves on this issue?

12 So what NIRS would request is that this
13 study be taken back and either, you know, sort of
14 repositioned as a site specific analysis of the Peach
15 Bottom plant, or that the basic assumptions that went
16 into this study be reexamined and a more credible study
17 be done. Thank you.

18 MR. SHERON: This is Brian Sheron. I mean,
19 first I would want to, you know, thank you for your
20 comments on that. But you know, I again will reiterate
21 that we chose Peach Bottom because it was the plant for
22 which we had the relevant information that we could start
23 this study.

24 You know, quite honestly, if we were to
25 start it for a different plant, we probably wouldn't be

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1 here today, we would probably still be working on it
2 because it takes a lot of time to gather the information,
3 build the models for the computers and so forth.

4 It's not something that's done overnight.
5 So the fact that we picked Peach Bottom was not, you know,
6 because we made the wrong choice. It was because we
7 wanted to get something that we could work on right away,
8 okay, and get some answers.

9 You know, and I can't explain it any better
10 than that. And with regard to how much is enough in terms
11 of spending, you know, I think as Jennifer had discussed
12 before, we have a regulation, 50.109 which talks about
13 cost/benefit and substantial increase in safety.

14 I joke about it, but a lot of people do, but
15 it's the only regulation on our books that applies to the
16 NRC staff, which was put there by our Commission.

17 And we have to follow that regulation, which
18 means we have to do cost/benefit analyses and we have to
19 determine whether or not there is a substantial increase
20 in safety for any regulatory action that we make that we
21 don't deem is necessary for adequate protection.

22 And so I think that cost/benefit analysis,
23 and we have a number of documents which talk about what
24 the criteria are for doing cost/benefit analysis in terms
25 of dollars per person-rem avoided, which you can see.

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1 And those are the costs that we look at. And
2 we can elaborate on that if you want, but you know, I did
3 want to point out that that's how we do our business.

4 MS. UHLE: This is Jennifer Uhle from NRR.
5 I would also like to add, the cost benefit does not have
6 to be considered if we feel that the action is necessary
7 for adequate protection, as Brian said. The cost
8 doesn't come into it.

9 And then in addition, the Commission can
10 choose to redefine the level of what is adequate
11 protection, the Commission can choose to not follow the
12 backfit rule.

13 But at this stage in the staff's work, we
14 do first determine if there's a substantial safety
15 benefit. Well, first we determine if there's necessary
16 for adequate protection.

17 If the answer is no, then the second thing
18 we do is determine whether or not there's a substantial
19 safety benefit. And from the analyses that we've done
20 at this stage, we don't see that there is a substantial
21 safety benefit.

22 But we still wanted to continue the work to
23 see if there was anything that would be cost beneficial
24 because that could influence the Commission's direction
25 to actually require the regulatory change.

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1 And again, the cost benefit is just part of
2 our regulatory process, and it's been publically vetted.
3 It's very similar to what other government agencies do,
4 other regulatory agencies.

5 But we didn't choose Peach Bottom because
6 it was the lowest risk. In fact, we recognize it's just
7 one data point.

8 And so in our Tier 3 activity that is going
9 to be public the end of September, we looked at the risk
10 posed by the other plants across the fleet, including
11 what we would say is the end associated with Pilgrim, and
12 we adjusted the terms to determine if there is either a
13 substantial safety increase, or if it is cost beneficial.

14 So we didn't just look at Peach Bottom in
15 our regulatory decision making.

16 MR. RAKOVAN: Okay. Let's go to Rochelle
17 Becker, then Dr. Henriette Groot and third, Sara Barczak.
18 Ms. Becker, if you could Star 1 to let us know if you're
19 on the line.

20 Okay, it sounds like you've dropped off the
21 webinar as well. So okay, let's go ahead. Dr. Groot,
22 if you're on the line, please hit Star 1, and then Sara
23 Barczak, third to Liz Apfelberg. Dr. Groot, are you on
24 the line?

25 OPERATOR: Sir, this is the conference

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1 coordinator. No one is queuing up.

2 MR. RAKOVAN: Okay, thank you. She had
3 asked to go late in the day, so I'll loop back to see if
4 she's joining us later. Okay, let's go to Sara Barczak,
5 if you're on the line with Southern Alliance for Clean
6 Energy?

7 OPERATOR: Her line is now open.

8 PARTICIPANT: Hello?

9 MR. RAKOVAN: I was looking for Sara
10 Barczak?

11 PARTICIPANT: Oh, sorry.

12 MR. RAKOVAN: Brooke, is there anyone else
13 identifying themselves?

14 OPERATOR: No, no one else has queued up.
15 Here we go, one more. One moment, please. Okay, your
16 line is now open.

17 MS. BARCZAK: Okay, hopefully this is
18 working. Good afternoon, this is Sara Barczak. I am
19 the High Risk Energy Choices Program Director with the
20 Southern Alliance for Clean Energy. We're a non-profit
21 membership organization that works on energy issues in
22 the southeastern United States.

23 Thank you for your time and for providing
24 a public works access to participate in today's important
25 meeting. I really appreciated all the comments I've

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1 already heard and the discussions.

2 It is our understanding that the incident
3 that prompted the need for the particular study we've
4 been discussing today was the Fukushima Daiichi nuclear
5 disaster in Japan.

6 And from what we know, the dry cask storing
7 site apparently made it through the earthquake and
8 tsunami unscathed, and that spent fuel pools experienced
9 damage and were of high concern for many following the
10 accident, and remain a serious concern even today.

11 Now we avoid it, and that reality was
12 brought up today. So given that fact, along with all of
13 the technical comments provided previously, and again
14 here today by the other commenters, and given that the
15 nuclear industry itself has been moving in the direction
16 of dry cask storage for quite a while now, we simply don't
17 understand why this study failed to recommend the need
18 to expedite the transfer of spent fuel out of high density
19 storage pools into low density open rack and dry storage.

20 There are some other human, environmental,
21 and financial costs of an accident at a spent fuel pool,
22 however unlikely, some possible near term concerns about
23 the affordability of implementing lower pool densities.

24 So there have been a ton of questions asked
25 today, and mine, I don't mean for it to be sarcastic, but

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1 it is a question. And I'll follow it with my closing
2 comment, but has the NRC asked the Japanese regulators
3 and technical experts involved with the ongoing
4 Fukushima disaster whether, given the choice, they
5 preferred dealing with the damaged densely packed spent
6 fuel pools over a damaged low density spent fuel pool?

7 And in further answer from the NRC staff
8 that we have heard today Southern Alliance for Clean
9 Energy believes the draft study is inadequate, and
10 request that the NRC start anew with an actual scientific
11 study of spent fuel pool fire risk as recommended in Dr.
12 Gordon Thompson's previously submitted comments. Thank
13 you.

14 MR. RAKOVAN: Could you repeat that last
15 couple sentences? You started to get a little fuzzy
16 there, please.

17 MS. BARCZAK: Did you hear the question, or
18 do I need to ask the question again?

19 MR. RAKOVAN: Yes, we got the question. It
20 was just the end there you kind of trailed off.

21 MS. BARCZAK: Okay. Well, so the end was
22 the recommendation that Southern Alliance for Clean
23 Energy believes the draft study we're talking about today
24 is inadequate and request that the NRC start anew with
25 an actual scientific study of spent fuel pool fire risk

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1 as recommended in Dr. Gordon Thompson's previously
2 submitted comments. Sorry if you heard bad quality
3 there on the line.

4 MS. UHLE: Okay, thank you for your
5 comments. This is Jennifer Uhle from NRR. We actually
6 have a great deal of contact with the Japanese regulator.

7 And I think as you may know, we actually had
8 a Japanese site team that was located in Tokyo for almost
9 up to a year after the accident.

10 I don't believe we've asked that specific
11 question about whether or not they would prefer that it
12 be low density loaded versus high density loaded,
13 although I can tell you that the rest of the spent fuel
14 pools in Japan use the high density loading.

15 And to my knowledge, at this stage they've
16 taken no action to go to a lower density loading. There
17 is, I think, some amount of confusion as to the status
18 of the spent fuel pools.

19 They are trying to remove the fuel from the
20 pools. They are looking at coming with a wet storage
21 transfer mechanism. That is not outside their range of
22 possibilities. That's a technology that has, you know,
23 been developed and deployed in various areas.

24 The concern more is the structural state of
25 the reactor building, and of course the contamination

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1 around the site. I would turn to my colleagues here if
2 anybody wants to add anything else, or if you have any
3 further information on the Japanese viewpoint.

4 MR. WITT: This is Kevin Witt, I'm the Japan
5 Lessons Learned Project Directorate. We do have
6 indication from the Japanese that there was no damage to
7 the spent fuel stored in their pools.

8 There may have been minor scratches from
9 debris falling into the pool. But they have done
10 inspections in the spent fuel pools. So we're not aware
11 of any deformation of the fuel in those pools.

12 And our understanding is that they are
13 proceeding with the removal of the fuel in the Unit 4
14 spent fuel pool. They were constructing a crane to get
15 that fuel out. And I believe that they were planning to
16 start that in November of this year.

17 MR. RAKOVAN: Okay, let's go ahead and move
18 on to our next speaker. I would like to go to Liz
19 Apfelberg. Following Liz, Lou Zeller, and third to
20 Kevin Kamps. So Ms. Apfelberg, are you on the line? If
21 you could, could you hit Star 1 please and identify
22 yourself?

23 OPERATOR: That party is queuing up at this
24 time. One moment. That line is open.

25 MR. RAKOVAN: Ms. Apfelberg, are you there?

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1 OPERATOR: She may need to unmute her
2 phone.

3 MS. APFELBERG: Can you hear me now?

4 MR. RAKOVAN: Yes we can. Please proceed.

5 MS. APFELBERG: Okay, good. There's been
6 several questions, but I don't think we've gotten a
7 really straight answer, and this is having to do with the
8 safety of dry cask storage over the spent fuel pools in
9 light of the fact that there was not damage to the dry
10 casks in Japan, no readings of radiation from the dry cask
11 storage, why do you not consider in your study the fact
12 that the dry cask storage is safer and say that we need
13 to go to expedited transfer?

14 That's one question. And the second being
15 that since you agree that your mission is public health
16 and safety and adequate protection of the health of the
17 public, then I don't see that cost/benefit should be
18 something that you consider.

19 You should be considering whether what you
20 recommend adequately protects the public, and then it's
21 up to the utility to decide if they want to spend that,
22 to have that cost. And if not, then they should just shut
23 down. So those are my two questions at this point.

24 MS. UHLE: Jennifer Uhle from NRR. Thanks
25 for your question. In the spent fuel pool study done by

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1 research, we did not in that study reassess the safety
2 of the casks.

3 Nonetheless, and I should have pointed this
4 out from an earlier question and a colleague of mine
5 highlighted this to me, so I appreciate that. We did
6 include a table of some analyses that had been done
7 specific to the safety of a cask.

8 And those are listed in tabular form in the
9 spent fuel pool study. At this stage, we recognize that
10 the spent fuel stored in the ISFSIs, or the dry cask
11 storage in Fukushima, you know, they were fine throughout
12 and after the accident.

13 We would also say that, and we've said it
14 a couple times, that the spent fuel pool stored in the
15 spent fuel pools were also adequately cooled, and there
16 was no major loss, or loss of inventory from the pool.

17 So you know, both the wet storage and the
18 dry storage was safe throughout and after the accident.
19 In terms of decommissioning, TEPCO, the Japanese utility
20 does want to remove the fuel from the spent fuel pool to
21 facilitate the decommissioning of their unit.

22 So that is the motivation for them to move
23 out the spent fuel pool. Looking at the raw risk
24 numbers, since the spent fuel pool study was not a
25 complete risk analysis, it was a consequence study that

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1 was informed by some probabilities, it's hard to compare
2 apples and apples.

3 We have not done in this study a comparison
4 of all of the risks associated with spent fuel storage
5 and all of the risks associated with dry casks. I think
6 there's a feeling in the public that dry casks that seems
7 to people is a safer option.

8 So what we did, we do have a regulatory
9 framework. And part of our regulatory framework that
10 the staff is required to follow does involve determining
11 whether or not a regulatory action increases the safety
12 to the public in a substantial manner.

13 And we have certain criteria that must be
14 met. And from our analyses, we have determined that
15 movement to a low density loading and using more dry cask
16 storage does not increase the safety to the public to the
17 point that would warrant regulatory action.

18 Now if we did think, and if we did calculate
19 to show that there was a substantial safety increase,
20 then we would then look to see the cost/benefit. At this
21 stage, we actually did that calculation, and we show that
22 it's not cost beneficial either.

23 If the staff and the Commission felt that
24 this movement to the low density storage was adequate,
25 or was necessary to provide adequate protection to the

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1 public, then we would not hesitate to impose those
2 requirements.

3 In fact, we have after Fukushima imposed a
4 number of requirements that are costing the industry
5 hundreds of millions of dollar per utility. So in the
6 cases of adequate protection, we don't worry about the
7 costs associated with that.

8 MS. APFELBERG: The answers to both of your
9 questions, I hope you do realize, and members of the NRC,
10 that basically the majority of people in the public would
11 disagree completely with what you say and feel that you
12 are more concerned with the costs to the industry than
13 to the protection of the public.

14 And we hope that there's not a major
15 accident at a plant, another major accident at a plant
16 in the United States that happens. Thank you.

17 MR. RAKOVAN: Okay. Let's go to Lou Zeller
18 followed by Kevin Kamps and third, Ace Hoffman. Lou, if
19 you're on the line, if you could hit Star 1, please.
20 Brooke, are we getting any reaction?

21 OPERATOR: Yes, we are. One moment please
22 as --

23 MR. RAKOVAN: Excellent.

24 OPERATOR: -- the line queues up. And his
25 line is open.

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1 MR. ZELLER: Hello, can you hear me?

2 MR. RAKOVAN: We can hear you, Lou. Please
3 go ahead.

4 MR. ZELLER: All right. Thank you for the
5 opportunity to speak to you today. I want to open with
6 a prologue. The industry term spent fuel is a misnomer.
7 When something is spent, it is consumed or used up.

8 Nuclear fuel stored in pools is full of
9 energy, but unusable because of its radioactive
10 byproducts. Any radiation in the reactor core limits
11 the utility of the uranium fuel.

12 Therefore it's heat and radioactivity of
13 that irradiated fuel which presents the problem now under
14 discussion. Now I would like to address the fundamental
15 problem with so called spent fuel study.

16 The two factors of risk assessment are, in
17 general, the magnitude of potential loss and the
18 probability that loss will occur. The Nuclear
19 Regulatory Commission uses a probabilistic risk
20 assessment to determine what can go wrong, how bad it
21 could be, and how likely it is to occur based on current
22 information.

23 Problem is that probabilistic risk
24 assessments do not account for unexpected failures. A
25 physicist writing for the Bulletin of the Atomic

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1 Scientists said, "The lesson from Fukushima, Chernobyl
2 and the Three Mile Island accidents is simply that
3 nuclear power comes with an inevitability of
4 catastrophic accidents.

5 "While these may not be frequent in an
6 absolute sense, there are good reasons to believe that
7 they will be far more frequent than quantitative tools
8 such as probabilistic risk assessments will predict. Any
9 discussion about the future of nuclear power ought to
10 start with that realization."

11 An earthquake's an unpredictable event.
12 Fukushima disaster occurred in an area with known seismic
13 history in a society well adopted to living on a fault
14 line.

15 Charles Richter, development of the Richter
16 scale said, "Prediction provides a happy hunting ground
17 for amateurs, pranks and outright publicity seeking
18 fakers."

19 Charles Richter, California Institute of
20 Technology professor of seismology spent most of his life
21 in this field. He assisted officials in Japan and
22 California with earthquake engineering and safety.

23 His description of earthquake predictors
24 ought to be taken seriously by the Office of Nuclear
25 Reactor Regulation, Office of Nuclear Regulatory

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1 Research and the Office of Nuclear Material Safety and
2 Safeguards.

3 For example, to estimate the earthquake
4 risks at North Anna, nuclear engineers used
5 probabilistic techniques to describe potential ground
6 motion. They attempted to account for all potential
7 seismic sources in the region around that plant, which
8 is located in Virginia.

9 The standard is ground motion that occurs
10 every 10,000 years on average. But the 5.8 scale
11 earthquake in Virginia in 2011 was preceded by a 5.8 quake
12 in 1897. Just 114 years separated the two quakes.

13 In June, of course, the Nuclear Regulatory
14 Commissions issued the consequence study of beyond
15 design basis earthquake affecting the spent fuel pool for
16 U.S. Mark I boiling water reactor.

17 Going to that draft, past risk studies have
18 shown that storage of spent fuel is safe and large release
19 due to an accident is low, the structures are likely to
20 withstand severe earthquakes without leaking.

21 These are the particular problems and the
22 shortcomings are as follows, in brief. The draft NRC
23 study excludes hazards of concurrent reactor accidents
24 known to impact the safety of the radiated fuel pool
25 systems.

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1 As Dr. Thompson has said, the physical
2 proximity of spent fuel pools to operating reactors and
3 their sharing of safety systems means that the use of high
4 density racks creates strong linkages between reactor
5 risk and pool risk.

6 That's what Dr. Thompson said. As you all
7 know, it was rapid, high energy combustion in the reactor
8 buildings and refueling bay at Fukushima which damaged
9 the irradiated fuel pools.

10 Second point. NRC staff dismisses aging
11 and deterioration of irradiated fuel pool systems by
12 ignoring the 2011 NRC sponsored study which concludes,
13 "As nuclear plants age, degradations of fuel pools are
14 occurring at an increasing rate, primarily due to
15 environment related factors. During the last decade, a
16 number of pools have had water leakage."

17 Instead, the NRC staff points to a study
18 done 25 years ago before aging effects were observed.
19 Now, if the Blue Ridge Environmental Defense League were
20 to bring such similarly dated information before
21 administrative judges in the license interventions we
22 are engaged in, it would be summarily dismissed.

23 Point number three. The draft study does
24 not comply with technical safety analysis standards for
25 reactors.

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1 Pursuant to 10 CFR 52.157, safety analyses
2 must incorporate key reactor station components,
3 including engineered safety features, auxiliary and
4 emergency systems, reactive waste handling systems, fuel
5 handling systems such as that an individual located at
6 any point on the boundary of the exclusion area for any
7 two hour period following an on site postulated fission
8 product release would not receive a radiation dose in
9 excess of 25 rem total effective dose equivalent.

10 Point number four. NRC study that San
11 Onofre Nuclear Generating Station in California
12 estimated that an earthquake caused fuel pool fire could
13 release approximately 2,500 times more radioactivity to
14 the general public than a dry cask failure.

15 At Fukushima, all the irradiated fuel dry
16 casks escaped damage during the earthquake and tsunami.

17 Point number five. In 2011, the Nuclear
18 Regulatory Commission's Fukushima Lessons Learned
19 Taskforce concluded that enhancements to safety and
20 emergency preparedness were warranted, made a dozen
21 recommendations for Commission consideration.

22 NRC staff prioritized and expanded upon the
23 Task Force recommendations in October 3, 2011 in
24 SECY-11-0137.

25 Sadly, these recommendations were ignored

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1 by the commission when they approved the plant Vogtle
2 construction and operation construction license in
3 February 2012, the first such license issued in 30 years.
4 Why were such important lessons not learned? Must we
5 wait for an American Fukushima?

6 Point number six. Senator Edward Markey,
7 in a letter to Nuclear Regulatory Commission Chairman
8 Macfarlane dated yesterday, September 17 said, "I
9 believe the NRC draft is biased, inaccurate and at odds
10 with the conclusions of other scientific experts,
11 including those expressed in a peer reviewed article that
12 was co-authored by you," that is Macfarlane, "in 2003."

13 Senator Markey continues, "Instead of
14 wasting more NRC's resources on studies that appear to
15 be deliberately designed to yield a no action outcome,
16 I urge you to direct your staff," again he's talking to
17 the chairman, "to read your 2003 paper along with other
18 scholarly materials on this topic and prepare a new study
19 that does not lack credibility." Those are the words of
20 Senator Markey.

21 Point number seven, finally. We agree with
22 Senator Markey and others here today who said the draft
23 study should be withdrawn and efforts to incorporate it
24 into the NRC's regulatory framework should be halted.

25 NRC should start a proper investigation of

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1 the risks and consequences of pool fires. If NRC staff
2 lacks the capability to do this work, you should locate
3 agents not dominated by nuclear industry messengers.

4 Thank you for the opportunity today. I do
5 have a final question, which has to do with the
6 administration. Have you taken steps to comply with
7 Executive Order 12898?

8 MR. WITT: Can you explain that one,
9 please? This is Kevin Witt.

10 MR. ZELLER: Yes, Mr. Witt. Executive
11 Order 12898 is the President Clinton's Environmental
12 Justice Order to all federal agencies.

13 MS. UHLE: Jennifer Uhle from NRR. Yes,
14 we're sorry here. We didn't quite hear your question and
15 we apologize for asking you to say it again, please.

16 MR. ZELLER: Of course. Have you taken
17 steps to comply with President Clinton's Executive Order
18 12898 issued in 1994 which is to all federal agencies
19 regarding the requirements of environmental justice.

20 MS. UHLE: This is Jennifer Uhle. Yes, the
21 answer to that question is yes we have.

22 MR. ZELLER: How so?

23 MS. UHLE: I'm not the technical expert in
24 this area. I don't mean to be bypassing your question
25 here. I'm going to look to the NRC members in the

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1 audience if there's somebody that can add some more
2 detail to that answer.

3 We're going to have to get -- Scott can you?
4 Okay, we have Scott Burnell here to help provide more
5 detail.

6 MR. BURNELL: Scott Burnell with the Office
7 of Public Affairs. Environmental justice is one of the
8 issues that's considered in environmental reviews for
9 licensing, both new reactors and license renewal
10 applications.

11 MR. ZELLER: But not with your ongoing
12 study of the fuel pool impacts?

13 MR. BURNELL: As both Brian and Jennifer
14 have stated numerous times, this is not a regulatory
15 action the agency is taking. It's a consequence study.

16 MR. ZELLER: I don't believe the order
17 specifically addresses one aspect of the agency's
18 responsibilities.

19 MS. UHLE: This is Jennifer Uhle from NRR.
20 Again, the study is just one data point amongst numerous
21 data points, including the regulatory analyses that are
22 a part of our regulatory procedure that has been in place
23 for, I would say, over 20 years that is documented in,
24 if you are interested in looking at it, it's an NRC
25 document called NUREG, N-U-R-E-G is the title /BR, which

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1 is new reg brochure. And the number, I believe, is 68.

2 Oh, excuse me, so it's NUREG/BR-0058. So
3 when we talk about our regulatory decision making, we're
4 using a number of data points, and then we're following
5 the well established regulatory decision making that's
6 outlined in that particular document.

7 I can provide a little bit more information
8 about the new reactors that are under construction being
9 vocal in summer. And those two plants are, of course,
10 going to be having to take measures that we have begun
11 to promulgate after Fukushima.

12 A number of those activities include, of
13 course, the looking at mitigating strategies. For
14 instance, looking at severe accident management
15 guidelines and improving the communications in the case
16 of station blackout.

17 There's a number of activities that you can
18 go to the NRC website under Fukushima and list them there.
19 But those new reactors will have to take those measures,
20 just like the operating ones. Thanks.

21 MR. ZELLER: Thank you for that reply, Dr.
22 Uhle. But forgive me if I'm underwhelmed. I'm familiar
23 with the environmental justice investigations done for
24 the Vogtle plant. We have many members in the Shell
25 Bluff community in Burke County, Georgia, as well as

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1 other communities in the southeast.

2 And that's the analysis in those cases does
3 not pass muster. I was hoping that at this level of the
4 NRC staff's deliberations that there would be a closer
5 attention paid to the requirements of disproportionate
6 impacts in communities of color from irradiated fuel,
7 whether it's stored in fuel pools or in dry casks.

8 MS. UHLE: Okay, thank you for your
9 comments.

10 MR. RAKOVAN: Okay, do we want to take a
11 quick stretch break? Yes? All right, let's say five
12 minutes because that usually turns into ten. So five
13 minute break, please.

14 (Whereupon, the foregoing matter went off
15 the record at 3:15 p.m. and went back on the record at
16 3:29 p.m.)

17 MR. RAKOVAN: Okay, I'm going to go ahead and keep
18 going through the folks that preregistered to speak
19 today. First, I'd like to see if Kevin Kamps is on the
20 line. After Mr. Kamps we'll go Ace Hoffman -- oh,
21 another live and in-person, okay. I apologize for that.

22 Then next we'll go to Ace Hoffman, and third
23 to Robert Gould. So Mr. Kamps, please.

24 MR. KAMPS: Thank you. Good day everyone.
25 My name is Kevin Kamps, radioactive waste specialist at

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1 Beyond Nuclear. And my first question is -- I have a
2 large number of questions, so is there some way that I
3 can submit those to be answered? I don't understand,
4 really, the proper way to do that. Because I don't have
5 time in this five minutes.

6 MR. WITT: Yes, this is Kevin Witt. You
7 can email me.

8 MR. KAMPS: Okay, very good. Thank you.

9 MR. RAKOVAN: And that's kevin.witt, with
10 two Ts, at nrc.gov.

11 MR. KAMPS: So I'll just get as far as I can
12 on my list. It was said, I believe, in the introductory
13 remarks by the NRC that none of the pools have leaked.
14 Actually, I have it right here in the notes. Twenty
15 Japanese spent fuel pools reported no leakage after both
16 the 2007 and 2011 severe earthquakes.

17 And I think the key word that's missing is
18 the word "yet." I think it's been communicated by
19 several speakers today that there's ongoing problems at
20 the Fukushima Daiichi site, perhaps most especially at
21 Unit 4. So we're not out of the woods yet.

22 And I did want to correct the record on a
23 number of points. It was also said by Dr. Uhle that an
24 effective evacuation had taken place at Fukushima
25 Daiichi. And there was an August 2011 New York Times

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1 article which quoted the mayor of Namie, which is a town
2 five miles from Fukushima Daiichi, who for lack of
3 guidance from both the national and prefectural
4 government decided to evacuate his town's population
5 further away from Fukushima Daiichi.

6 And most ironically and unfortunately for
7 those people directly into the plume because three
8 separate federal ministries have withheld information
9 from the public about the direction of the fallout from
10 Fukushima. And most tragically, they were literally
11 camped out under precipitation and probably got bad
12 doses.

13 They were drinking and cooking with water
14 from surface streams and the children were playing in
15 this fallout. So the mayor actually referred to the
16 people who withheld the data from him as murderers. That
17 was his word. So I'd have to challenge that notion of
18 an effective evacuation at Fukushima Daiichi.

19 And to bring it closer to this context, when
20 I attended the annual performance assessment at Kewaunee
21 this past June, it appears that there may be a move on
22 at Kewaunee to do away with the emergency planning zone
23 now that that reactor is permanently shut down within a
24 year or two, I believe.

25 And questions were asked by local

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1 residents, how can that be? How can you do that when
2 there's still irradiated fuel in the pool? And this very
3 study was trotted out by the NRC staff in the room, even
4 though this hadn't been published yet, made publically
5 available that no, it's actually not a problem.

6 There's a study that says it's not a problem
7 so it's okay that we do away with the emergency planning
8 zones. So I've heard a number of times today, an
9 assumption by the NRC that evacuation will be smooth and
10 successful and that's how we can determine the
11 cost/benefit analysis finds that we don't need to
12 expedite transfer.

13 So can someone address those
14 inconsistencies for me?

15 MS. UHLE: Excuse me, this is Jennifer
16 Uhle. Randy Sullivan from our Office of Nuclear
17 Security and Incident Response.

18 MR. SULLIVAN: Hi. Randy Sullivan. I'm
19 an emergency preparedness specialist at NRC. Matter of
20 fact I've done emergency preparedness just about all of
21 my career.

22 Let's start with the last issue first.
23 Kewaunee must apply for an exemption to reduce its
24 emergency plan, and it is not reduced as we sit right now.
25 So --

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1 MR. KAMPS: Yes, but the answer that was
2 given in Carlton, Wisconsin, this June, was that within
3 12 to 24 months a shut down reactor could do away with
4 its emergency planning zone. And I assume the reason
5 that the question was asked and the answer was given was
6 that that is under consideration at Kewaunee.

7 MR. SULLIVAN: When they file their
8 paperwork and it is adjudicated that is a possibility.
9 But that doesn't mean the whole emergency plan goes away.
10 There will still be an emergency plan.

11 The next, going backwards if I'm
12 remembering your questions right, regarding evacuations
13 in the U.S., I take great exception to your comparison
14 of our program to the Japanese program. I think there
15 is significant differences in the way we handle
16 evacuations.

17 There's no federal ministry that issues
18 evacuation orders in the U.S. That's done by local
19 authorities who have proved that they're really quite
20 competent in managing evacuations. We studied a couple
21 hundred evacuations nationwide in this country, they
22 were all successful.

23 I can point to one evacuation in 15 years
24 that was not successful. All the others saved lives.
25 The local authorities are pretty good at this, and if I

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1 might say with all due respect, without a whole lot of
2 guidance from Washington.

3 I think if you talk to the local authorities
4 as to whether they can evacuate their county or not should
5 it be necessary, I think you'll get an illuminating
6 answer. I can't remember what you said before that.
7 If there's something I can help you with I'd be happy to.

8 MR. KAMPS: Okay. Well, I will take
9 exception to your exception. I think that one exception
10 that you probably cited was Katrina, which I think has
11 a lot of lessons for the NRC to learn. Ironically
12 enough, there was an emergency preparedness conference
13 taking place at NRC as Katrina broke, and I think the
14 thousand people or more who died in New Orleans would
15 probably take exception to --

16 MR. SULLIVAN: Actually, it was not
17 Katrina. Randy Sullivan again, if I can add. The
18 congressional study of Hurricane Katrina determined that
19 the evacuation itself was successful. Everybody who
20 wanted to evacuate whether they had money or not could
21 evacuate. The problem was not encouraging the people to
22 evacuate and not to have a plan to deal with them when
23 they don't.

24 Hurricane Rita, some six weeks later,
25 actually was a very, it was the one evacuation we've

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1 studied that actually killed people.

2 MR. KAMPS: Yes, I think as I said, a lot
3 of people died in New Orleans. But, you know, it wasn't
4 me who brought up this issue. It was the NRC, Dr. Uhle,
5 who said that the evacuation at Fukushima Daiichi was
6 effective, and that's what I was referring to. It was
7 not effective for, one example, the town of Namie.

8 So another point that was raised by a
9 previous public member, Lou Zeller, was that U.S. Senator
10 Ed Markey just yesterday pointed out the irony to
11 Chairwoman Macfarlane that she joined several people who
12 are in the room today including Robert Alvarez and Ed
13 Lyman, Gordon Thompson who is on the phone, in a January
14 2003 study, peer reviewed study that actually saw a great
15 cost/benefit advantage to expediting the transfer of
16 irradiated nuclear fuel out of pools into dry cask
17 storage. So I would just underline that point.

18 I just wanted to touch on another accident
19 scenario that was not looked at apparently in this study,
20 and that's heavy load drops. There have been some near
21 misses around the country, at Palisades in 2005, at
22 Prairie Island in the mid-1990s.

23 So with these optimistic assumptions that
24 the pool will completely drain of its water, it seems like
25 there are some worst case scenarios that for one, Dr.

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1 Thompson has pointed out where there's a partial drain.
2 And we of course, as one of the two dozen groups
3 represented by Dr. Thompson and by Diane Curran in that
4 coalition, endorse that concern that there could be worst
5 case scenarios than what you've looked at. And so could
6 you address that?

7 MR. JONES: Sorry. This is Steve Jones in
8 the Office of Nuclear Reactor Regulation. I guess from
9 a heavy loads perspective, first of all, there's a large
10 fraction of the fleet has separate cask loading areas
11 that are separated from the spent fuel pool and the cranes
12 are restricted from operation over those pools. So for
13 those facilities we don't expect any impact from heavy
14 load drops.

15 For the remaining pools there's some that
16 are founded on bedrock and others that have very thick
17 floors on the order of four or more feet thick that may
18 be susceptible to cracking in the event of a load drop
19 from some heights, but that we don't have detailed
20 evaluations of those.

21 But regardless of that we do expect that if
22 there was a problem with a cask drop it would largely be
23 a leak at the bottom of the pool not a leak somewhere that
24 would cause a partial drain condition.

25 MS. UHLE: This is Jennifer Uhle from NRR.

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1 I can add to that too. In our regulatory analysis,
2 although the cask drop was not explicitly modeled in the
3 spent fuel pool study, in Appendix D to the spent fuel
4 study we do consider looking at NUREG-1738 which was a
5 previous study that was done.

6 We took the initiating of that frequency
7 from cask drop and that was factored into our regulatory
8 analysis. So if you are interested you can take a look
9 there. There's a little bit more information.

10 MR. KAMPS: Yes, the McFarland, et al.,
11 study from 2003 also referred to that as a citation that
12 the significance of a heavy load drop.

13 I wanted to touch on Fukushima Daiichi
14 again. It's interesting to hear what the NRC has had to
15 say today. Because there was a point in time when the
16 chairman, Greg Jaczko, the NRC's representative on the
17 ground in Japan, Chuck Casto, at the time with the best
18 information they had available were making precautionary
19 assumptions that Unit Number 4's pool had lost water,
20 that there could be a pool fire underway. And that
21 contributed perhaps in large part to a decision to
22 evacuate Americans 50 miles away from Fukushima Daiichi.

23 And also U.S. advice to Japan, I guess you
24 could say, probably contributed to Japanese decisions to
25 use helicopter water drops as many as five days after the

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1 initiation of the catastrophe at Fukushima Daiichi, the
2 use of concrete pumping trucks to get water into the
3 pools.

4 So today it's been expressed as there were
5 no problems with the pools. There was a period of time
6 when the NRC was quite concerned that there were
7 catastrophic problems with the pools. So it seems like
8 catastrophic problems with pools, that is, fires
9 releasing catastrophic amounts of hazardous
10 radioactivity is within the realm of possibility and
11 should be defended against.

12 But you wouldn't know that listening to what
13 NRC has to say today as compared to, let's say, the first
14 week of the Fukushima Daiichi catastrophe when it was
15 believed that there was a fire underway.

16 MS. UHLE: Yes, this is Jennifer Uhle from
17 NRR. Yes, a number of us were in the incident response
18 center here during and after the Fukushima event.
19 Again, we talked earlier about the rationale for what we
20 didn't think -- well, there was the hydrogen explosion
21 and that we thought, well, we didn't at that time
22 understand that the building that the hydrogen was
23 migrating from, the Unit 3 reactor building.

24 So with the hydrogen explosion we didn't
25 quite understand what was happening there. So to take

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1 a conservative measure when the Japanese said, do you
2 think it's a zirconium fire, we said, well, we don't know.
3 We weren't getting a lot of information.

4 And so there was a suggestion, if you have
5 water available put it in. Now it turned out that that
6 wasn't the case, but we felt that was conservative at the
7 time. And it really was highlighted to us the importance
8 of situational awareness in a reactor accident scenario.

9 And as a result, post-Fukushima we've
10 required licensees to put in spent fuel pool level
11 instrumentation so that again under such a scenario the
12 operators would be able to better understand the levels
13 in the pool to then hopefully not distract them.
14 Although we don't believe that such a drain-down is
15 probable, but because of the lessons learned that it was
16 distracting that we took that action.

17 MR. KAMPS: And I commend the NRC for taking
18 conservative actions like that. I would point out that
19 one of the nearest misses we've had with a pool drain-down
20 was a frozen pipe at Dresden Unit 1. So I just find it
21 astounding that some half-century after these reactors
22 were designed that there's still no instrumentation on
23 the pools to know where the water's at.

24 The final point I'll make is regarding
25 terrorism and security issues. With mass shootings on

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1 U.S. Navy bases, U.S. Army bases, on the other side of
2 the coin, a nonviolent action at the Oak Ridge
3 weapons-grade uranium depot, it's pretty clear that the
4 highest security zones in this country are vulnerable to
5 infiltration.

6 And the example I'll give for a nuclear
7 power plant is Palisades in Michigan, where the head of
8 security, long story short, was a complete fraud who had
9 fabricated his security clearances, had fabricated his
10 credentials to hold that position, and fortunately was
11 not a threat although his behavior would have indicated
12 that he was a threat because he bragged about his violent
13 career, I guess you could say, which seemed to have gotten
14 him the job.

15 So that wasn't the only plant he worked at.
16 He worked at Seabrook as well. And it was Esquire
17 magazine that broke this story in May of 2007. So it
18 seems to me that an intentional insider attack on a
19 high-level radioactive waste storage pool may be the
20 worst case scenario, and I wonder why that hasn't been
21 considered in this study.

22 MR. WAY: My name's Ralph Way. I'm a
23 senior technical advisor for security in the Office of
24 Nuclear Security and Incident Response. We have looked
25 at the insider, and that look has intensified as a result

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1 of recent incidents as well.

2 We have a behavioral observation program
3 and a number of other programs put in place to ensure that
4 individuals are both screened and they're monitored
5 while they're onsite.

6 MR. KAMPS: So referring back to my example
7 again, William Clark at Palisades, chief of security,
8 apparently passed all of NRC's and Consumers Energy's and
9 Entergy Nuclear's screening procedures. So how did he
10 get his job if NRC has these screening procedures in
11 place?

12 MR. WAY: Well, we put the screening
13 procedures in place. He goes through a background
14 check, and there are a number of other agencies that are
15 involved. But even once an individual is onsite in a
16 job, there's a behavioral observation program and other
17 programs in place to monitor an individual's activities
18 as he goes forward. That's how he was detected.

19 MR. KAMPS: What I find ironic, and I
20 encourage you to read the Esquire magazine article, May
21 of 2007. If an Esquire reporter can detect aberrant
22 behavior with the chief of security at a U.S. nuclear
23 power station, then I don't understand how the NRC missed
24 that.

25 And, you know, just citing the Navy yard

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1 shootings two days ago, that individual had a security
2 clearance. He also had a pass. That's how he got in.
3 So if we can't secure the weapons-grade uranium storage
4 depot in the United States, I take NRC's assurances with
5 a grain of salt about security at these --

6 MR. WAY: Well, I'll just make one
7 additional point in addition to the behavioral
8 observation program. There are a number of other
9 physical barriers that are put in place to protect plants
10 and plant material from sabotage.

11 MR. KAMPS: Yes. The examples I've given
12 have shown that other agencies of the federal government
13 have failed in those regards. Thank you.

14 MR. RAKOVAN: Okay, let's go to Ace Hoffman
15 then Robert Gould, and third to Franklin Frank. Ace, if
16 you are on the line can you please hit Star 1?

17 OPERATOR: And his line is open.

18 MR. HOFFMAN: Okay, can you hear me?

19 MR. RAKOVAN: Yes, we can. Please go ahead
20 sir.

21 MR. HOFFMAN: Okay, thank you very much.
22 In listening to Kevin Kamps' presentation and the NRC
23 response I'd like to make a comment, first, on the
24 evacuation issues in Japan. Because of going around
25 trying to get San Onofre closed over the last couple of

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1 years, one of the places that we went to besides all the
2 city councils was the emergency responders. And they
3 were adamant that as soon as you start to talk about
4 anything having to do with nuclear -- now they did believe
5 that they could evacuate if necessary -- but if you
6 started talking about nuclear they said, we don't
7 understand anything about that.

8 We get that from the experts, and they're
9 talking about you guys in Washington. So asked exactly
10 which community is going to be evacuated, they have no
11 idea and they're going to be relying on you to do it. And
12 that's the part that failed in Japan, not the little guy
13 who wanted to know what he was supposed to do, but the
14 authorities who were going to tell him what to do. And
15 that's your responsibility and you're the ones that
16 failed in Japan.

17 So let's hope that you do better here, but
18 your answer did not do better. You said, no, the local
19 guy's going to be handling it, they did an evacuation.
20 Yes, they are, if they know that they're supposed to do
21 it.

22 Okay, now what we've been talking about
23 here, I've heard that the baseline is the dry cask
24 storage. Is the spent fuel pool safer than the dry cask
25 storage? And that we're relying on that as a baseline

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1 because of NUREG BR-0058. And apparently what that
2 NUREG regulation does is it moves the baseline to what's
3 considered zero for another study, so the one in 10,000
4 years of per accident for, you know, accidents per year,
5 1 in 10,000, and things like that are all part of that
6 baseline.

7 And we're not really considering the time
8 factor of when are we going to move this stuff to Yucca
9 Mountain? If it stays in the pool for two years and then
10 gets moved to someplace that's either interim or is safer
11 or far away from where it is versus if we move it to the
12 dry casks and then say, well, there's other places we need
13 to worry about more, it's going to stay in the dry casks
14 for 80, 100, 300 years, whatever.

15 Another baseline factor that's not being
16 considered is the shutdown factor. I mean we didn't
17 hear, we heard somebody say, and it was not agreed with,
18 that a dry cask, a single dry cask with a satchel charge
19 would be about 2,500 times less risky than a spent fuel
20 pool fire. And so I'm wondering how many times less than
21 shutting a reactor down, you know, what's the difference
22 there? What is our baseline for this sort of thing?

23 And then moving on to the security issues
24 that we're not allowed to talk about -- airplane strikes.
25 We're talking about small airplanes, small amounts of

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1 fuel and low speed. We're not talking about what
2 actually happened on 9/11 and similar types of things.

3 Whether or not the casks can be transported
4 or dropped, we're talking about maybe a six-inch post or
5 an eight-foot drop when, really, these are unrealistic
6 values. What about the entire cask being crushed as it
7 goes under an overpass or something like that?

8 Again, are we going to leave it in dry casks?
9 Are we going to move it? Are we going to leave it in spent
10 fuel pools? There's more than the two choices. And why
11 would any terrorist get onsite just to use one satchel
12 charge? I think it would be far more than one.

13 A couple more items. During your
14 presentation, these are very complicated issues with a
15 time factor involved, I didn't see any graphics, fancy
16 charts, showing how these drop over time. Not just the
17 temperature or the radiological chance, dangers, but
18 what about earthquakes, anything over a long period of
19 time? So if we move it to dry casks it's going to stick
20 around a long time. If we leave it in spent fuel pools
21 because we're going to move it away soon it's a different
22 calculation.

23 And Fukushima was mentioned. We're two and
24 a half years away from it almost, and yet you guys don't
25 know what to do about Fukushima. And this is rather

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1 important. You said that you have people onsite in
2 Tokyo, and Tokyo's so far away from Fukushima that the
3 Olympics are going to be held there. That's not really
4 onsite. I think you're afraid to go onsite and I don't
5 blame you.

6 So I don't want to see one dry cask compared
7 to a reactor spent fuel pool fire. I want to see
8 fabrication errors included, unsafe transfer included,
9 and other events all extrapolated to not one pilgrim
10 reactor but a hundred very different reactors.

11 The chances of this study being accurate to all of
12 the different reactor situations is, you know, one
13 percent because they're all very, very different. They
14 all have enormously thick, and rooms full of manuals.
15 Not one compares to another.

16 So I think that's about all the things that
17 I would like to cover, and I look forward to getting the
18 answers to this, not just here at the panel today but in
19 another kind of, these are things that we need to change.

20 We need to stop talking about incremental
21 safety issues, but relook at the whole situation and what
22 is safe for America's nuke waste. We haven't solved it
23 in 65 years. Thank you very much.

24 MS. FINCH: Thank you Mr. Hoffman. My name
25 is Lynne Finch. I'm the assistant facilitator. Did you

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1 have a specific question that you'd like an answer to
2 today?

3 MR. HOFFMAN: Well, other than what is the
4 baseline that we're talking about what the dangers are,
5 I don't think there was really a very specific one.

6 MS. UHLE: Hi, this is Jennifer Uhle from
7 the Office of Nuclear Reactor Regulation. The question
8 that we're trying to focus ourselves on here is whether
9 or not there's a substantial increase in safety by moving
10 the older fuel, which is typically the five year old fuel,
11 from the high density pools into dry cask storage that
12 would then create a low density loading situation in the
13 spent fuel pools.

14 And --

15 MR. HOFFMAN: Sure, but it creates a
16 permanent situation in the dry cask storage arena, and
17 there's a time factor involved.

18 MS. UHLE: I'm sorry. I didn't hear you.
19 If you could repeat your statement again?

20 MR. HOFFMAN: Yes, thank you. Sorry.
21 Once you move the older fuel out of the spent fuel pool
22 you create a safer situation in the spent fuel pool which
23 you're arguing is not substantially safer. But you now
24 create a permanent situation of having an additional dry
25 cask or ten dry casks or 50 dry casks which are now going

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1 to sit for dozens, maybe even hundreds of years.

2 So is that time factor being considered as
3 to how long you would have moved it from the spent fuel
4 pool offsite completely versus from the spent fuel pool
5 to the dry casks where it remains for 200 years?

6 MS. UHLE: Yes. We didn't address what
7 specifically the risks were for the fuel in the dry casks
8 because the public interest that we had heard and the
9 request from Congress was to determine whether we need
10 to take regulatory action to move it into the dry casks
11 because of the viewpoints that many share of that.

12 Their feeling is that the dry casks are
13 safer. And they're not, in that determination I don't
14 believe that they are as concerned about the aging of the
15 dry casks as in their perception the risk in the spent
16 fuel pool. So when we did our analysis we assumed pretty
17 much that there was no risk associated with dry cask
18 storage.

19 And so that would maximize the safety
20 increase of going to the lower density loading
21 configuration. But when we did so we still did not reach
22 enough of a safety benefit to warrant our regulatory
23 action. So I hope that answers your question.

24 MR. HOFFMAN: I suppose so. Thank you.

25 MR. RAKOVAN: Okay, if next we could go to

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1 Robert Gould, followed by Franklin Frank, and third,
2 Becky Rafter or Diane Valentine.

3 Mr. Gould, if you're on the line can you
4 please hit Star 1?

5 OPERATOR: That party is not queuing at
6 this time.

7 MR. RAKOVAN: Okay, thank you, Brooke.
8 Let's see if Franklin Frank is on the line please. Mr.
9 Frank?

10 OPERATOR: And I do believe that party is
11 queuing at this time. One moment.

12 Mr. Frank, your line is open.

13 MR. FRANK: Thank you. I'm very pleased to
14 be able to comment today, and I'm honored to be in the
15 company with so many very articulate and highly qualified
16 speakers. I generally agree with most of the speakers
17 who have been concerned about the conclusions of your
18 report.

19 As a former fire chief who responded to
20 emergency incidents at Diablo Canyon Nuclear Power
21 Plant, I've taken a key interest in the plant. And
22 before retirement I was appointed to the county nuclear
23 waste management committee and did further study on high
24 level nuclear waste storage and transportation.

25 And I was quite surprised when I read the

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1 conclusions of your report that indicated that it would
2 not be cost effective to reduce the density in the spent
3 fuel pools. We looked at these issues very carefully and
4 concluded that it was almost a no-brainer to reduce the
5 densities in the spent fuel pools, and that was before
6 there was additional information concerning the
7 possibility of spent fuel pool fires.

8 The thought that the spent fuel pool is an
9 active system, requires constant cooling is something to
10 be considered, considering if there was an event that
11 contaminated the entire site there would be no one to keep
12 spent fuel pools cool.

13 I was also concerned that the scope of your
14 study was quite limited. It focused on strictly direct
15 impact of seismic damage to the pools. And this was a
16 very narrow perspective. There's many other things that
17 could impact the pools and their integrity.

18 Even though the pools might stay as an
19 integral entity and the racks would stay okay, I am very
20 concerned, and I've asked this question on numerous
21 occasions to the NRC and event safety committee about the
22 integrity of the fuel rods themselves.

23 These rods, particularly since high burnup
24 fuel is being used now, the cladding, basically the
25 zirconium tubes which contain the pellets, the fuel

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1 pellets, tend to degrade from exposure to high levels of
2 radiation and also a high temperature borated water.

3 And I think that it's important to
4 understand that any serious shock to the pool, even
5 though the pool and the racks stay intact, might cause
6 significant damage to the fuel rods and might even allow
7 the fuel pellets to fall to the bottom of the spent fuel
8 pools.

9 If this were the case it could impact the
10 cooling. If the cooling was compromised this pile of
11 rubble and pellets could heat up and generate radioactive
12 steam, perhaps hydrogen could be released, and it would
13 be very difficult to control.

14 I've asked this question and have not gotten
15 a specific answer from anyone. They say, well, that's
16 an interesting question. Well, it's more than
17 interesting. It's critical. If the integrity of those
18 rods are impacted and they start falling to the bottom
19 and accumulating at the bottom of the pool it could lead
20 to a serious problem and perhaps even a pool fire.

21 This could be the result of an earthquake,
22 an airplane crash or a bomb. I would like to know if this
23 has been studied, and if it's been studied I would like
24 to know what methods were used.

25 MR. PIRES: This is Jose Pires from the NRC

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1 Office of Research. First, considering the damage to
2 the rods themselves, the racks where the fuel is stored
3 are sliding racks. They can slide in the pool so they
4 are not going to be subjected to very large acceleration
5 forces.

6 Besides that, the concern normally that
7 exists with the fuel rods is cask drops in which the
8 accelerations are 20Gs or higher, which are much higher
9 than the accelerations for seismic loads. I think
10 that's my response.

11 MR. FRANK: Well, I am concerned that
12 you're only looking at seismic only. I would like to
13 know if you've studied the accelerations due to an
14 aircraft crash, particularly in boiling water reactors
15 that are elevated, and also bomb damage.

16 Not necessarily that the damage would
17 impact the pool to the point where it could cause it to
18 lose water, but simply accelerating the size of the pool
19 and the racks that could degrade the rods. I understand
20 the rods are subject to significant degradation and have
21 been broken just by moving around.

22 So can you tell me what kind of studies have
23 been done?

24 MS. UHLE: This is Jennifer Uhle from NRR.
25 After 9/11, or post-9/11 we had done numerous studies,

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1 very detailed analyses looking at spent fuel pool
2 integrity and the impact of the reactors due to aircraft
3 impact. Unfortunately can't get into a lot of details
4 on that because it is classified information. We can't
5 talk about that.

6 But as a result, we did take some regulatory
7 actions and we're confident that there's adequate
8 protection assured from the aircraft impact for both the
9 pools and the reactor. Part of what we're doing
10 post-Fukushima is actually to increase the ability of the
11 licensees to be able to respond, not from a security
12 standpoint but ultimately from a beyond design basis
13 event that will provide even more portable equipment that
14 can be brought to bear in the case of such an event.

15 MR. FRANK: Thank you for the information.
16 I'm still very uneasy about your response considering it
17 doesn't sound like you've actually conducted physical
18 tests. And I have some real serious concerns about your
19 models that have been used in the past, and I think
20 Mitsubishi would probably agree with me.

21 Their models didn't quite work out for the
22 steam generation down at San Onofre, and almost all your
23 computer models have been based on certain assumptions
24 that proved to be wrong. So I would think that you could
25 actually create a test system that would actually test

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1 this in reality.

2 Now I find it difficult to think that these
3 racks would be sloshing around in there without damaging
4 the rods in an actual test, and I don't see why you
5 couldn't come up with a simulation, not using a computer
6 but actual models of a spent fuel pool and some examples
7 of assemblies that approximate what is actually in the
8 pools.

9 MR. WAY: This is Ralph Way. I'm a senior
10 technical advisor for security in the Nuclear Security
11 Incident and Response. As Dr. Uhle indicated, we have
12 done a number of experiments. But we've also done actual
13 mock testing where we've taken different explosive
14 charges, weights and geometries, and physically fired
15 them against targets and exemplars of spent fuel, taken
16 that data, analyzed it and then taken appropriate
17 measures to mitigate the effects of those types of
18 charges.

19 MR. FRANK: Well, thank you for the
20 information. This is the first time I've ever gotten any
21 answers whatsoever. I'm still pretty uncomfortable
22 with the tests that I've investigated. I've
23 investigated these tests that you've done in the past,
24 and in many cases they don't convince me that there's not
25 some risks involved, some significant risk.

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1 And basically why I called today was because
2 I'm a landowner and a five-generation farmer who could
3 be contaminated if there was a serious problem at Diablo
4 Canyon, and I think that you have the obligation to make
5 sure the risks are absolutely at the minimum.
6 Cost/benefit analysis has no place in protecting the
7 public, and I certainly agree with many of the people that
8 spoke before me. Thank you very much for the time and
9 I hope you take these comments seriously.

10 MR. RAKOVAN: Thank you sir. Let's go to
11 Becky Rafter or Diane Valentine, then to Linda Lewison,
12 and third to Rod McCullum. So Ms. Rafter or Ms.
13 Valentine, are you on the line? Could you please hit
14 Star 1?

15 OPERATOR: And someone is queuing up at
16 this time.

17 MS. RAFTER: Good afternoon everyone.
18 This is Becky Rafter with Georgia Women's Action for New
19 Directions, and both professionally and personally we
20 work with community members who are living around the
21 Plant Vogtle and Plant Hatch reactors here in Georgia.

22 And I am calling in to encourage the NRC to
23 further revamp and further revise this particular study
24 in order to make it more comprehensive, and to look in
25 greater detail at the risks of spent pool fires, and also

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1 to take particularly into consideration a cost/benefit
2 analysis of the risk of fire versus the risk of a cask
3 rupture, in particular around the extremely high
4 percentage of less radioactive release in the case of a
5 cask rupture. And I would like to echo what

6 the gentleman said before the break around including an
7 expanded study and analysis around an environmental
8 justice analysis, in particular with regards to the
9 extreme difficulties of communicating with and among
10 rural communities living near these reactors
11 particularly in Georgia, and also of the difficulties of
12 evacuation and of preparedness in the community.

13 And I just mainly, as yet we don't feel that this
14 study has robust enough data to make a strong conclusion,
15 and we highly encourage NRC to expand the survey to
16 include the concerns that were brought up today.

17 And I just want to thank all of you for
18 taking the time to listen to these comments, and we
19 recognize that like most of us on the phone you all as
20 researchers and administrators also have as the highest
21 regard to safety of people working and living around
22 these facilities. So thank you for your time.

23 MR. RAKOVAN: Okay, let's go to Linda
24 Lewison followed by Rod McCullum, and then third to Gail
25 Comer. Ms. Lewison? If you are on the phone lines can

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1 you hit Star 1 please.

2 OPERATOR: And someone is queuing at this
3 time. And your line is open.

4 MS. LEWISON: Hello, this is Linda Lewison.

5 MR. RAKOVAN: Go ahead, we can hear you.

6 MS. LEWISON: Hello?

7 MR. RAKOVAN: Yes, we can hear you. Please
8 go ahead.

9 MS. LEWISON: Okay, I'm speaking as a
10 member of Sierra Club Nuclear Free Campaign and the
11 Nuclear Energy Information Service, 32 year old watchdog
12 in Chicago.

13 Last December we held a conference held by
14 NEIS to call attention to the problem that the fuel pools
15 were not built to accept indeterminate and
16 ever-expanding amounts of radioactive waste. We can't
17 really properly describe the scope of the problem even
18 with your study until we take into consideration that we
19 need to stop making more nuclear energy in order to even
20 get a handle on the numbers that we are talking about to
21 solve the particular radioactive waste transfer problem
22 that study is addressing.

23 As you heard previously from Tom Rielly, we
24 around the Great Lakes are the rate payers who are funding
25 the largest decommissioning in history at Zion, Illinois

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1 is closer to Chicago, as are all of Illinois' reactors,
2 than Tokyo is to Fukushima.

3 We also have the Kewaunee reactor in
4 Wisconsin facing a fuel transfer, and we have the dry
5 casks from the fuel transfer at Big Rock Point in
6 Michigan. And we have Palisades looming over as it's
7 expected to be closed soon because of its legitimate
8 problems, and facing a new set of problems associated
9 with decommissioning and spent fuel transfer decisions.

10 So we around the Great Lakes are surrounded
11 by the risks associated with irradiated fuel transfer
12 decisions. My questions relate to the Zion site, the
13 largest decommissioning in history that's supposed to
14 begin on the 1st of November as we call it, 60 casks each
15 to be a five-day transfer operation lasting over the next
16 300-plus days.

17 We are facing in actual time, in immediate
18 time, the problem of the risks from sudden drops and
19 partial draining of fuel pools 60 times from the 60-plus
20 transfers to 60 dry casks within the year.

21 My first question is, what is the NRC's plan
22 to provide public oversight and transparency for this
23 process on both the fiscal and safety fronts, and what
24 back up plans are being provided in case something
25 untoward and dangerous happens?

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1 When we asked at the public meeting of the
2 Zion Community Action Council about even a single fire
3 engine being around we were told not to worry, things
4 looked perfectly safe. And my second question relating
5 to Zion is the following.

6 MR. RAKOVAN: Ma'am, excuse me. This is
7 Lance Rakovan and I'm the facilitator here. Our Region
8 III office in Chicago has the lead for the Zion project.
9 And so, I mean we could take a stab at some of these
10 answers, but there's no guarantee that we're going to be
11 able to answer them with any accuracy because we just
12 don't have the people here who have the background to
13 answer those questions fully.

14 So we can get you a contact in the Region
15 III office if you'd like to, or you can email one of us
16 and we can send you that contact. But I don't think we're
17 going to be able to do your questions justice given that
18 we don't have the expert here.

19 MS. LEWISON: That's fine. I'll take the
20 contact, and let me just move on to the second question
21 which is a little more specific.

22 MR. RAKOVAN: Okay.

23 MS. LEWISON: If you are recommending
24 keeping irradiated fuel in the irradiated fuel pools as
25 long as possible, why have you endorsed Exelon emptying

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1 the irradiated fuel pools at Zion ten years ahead of
2 schedule? Although this reactor has been closed for
3 many years, is that reason enough to empty these fuel
4 pools this far ahead of schedule? What is Exelon's
5 rationale for doing this?

6 And if there is time, my last question.
7 What is your recommendation including the specific time
8 frame for what you recommend doing about the irradiated
9 fuel pools at Fukushima? Are you part of the global
10 group advising them currently and what are you advising?

11 MS. UHLE: This is Jennifer Uhle from the
12 Office of Nuclear Reactor Regulation. Let me respond to
13 your last question first, and that is, we have a great
14 deal of contact with the regulatory agency in Japan and
15 so does the rest of the world in learning from the
16 Fukushima results, but we are not an official advisory
17 capacity although we do stay abreast of what their plans
18 are and what they're doing.

19 So I can't add anymore than that as far as
20 any recommendations that we haven't given any to TEPCO
21 or to the regulator with regard to their spent fuel pool
22 campaign.

23 With regard to Zion, again Zion
24 decommissioning is handled out of Region III. And as
25 part of their decommissioning project that was approved

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1 by the agency and is under constant oversight by the
2 agency, if they're choosing to move their fuel into
3 storage that is up to them as far as the timing.

4 They do have to meet the regulatory requirements
5 specifying what is necessary under decommissioning and
6 also consistent with their decommissioning plan. But we
7 don't, and this study is not recommending that the fuel
8 be stored in the spent fuel pool, but it's also not
9 recommending that the fuel be moved to the dry casks.

10 I mean there is a physical limit. After the
11 fuel is irradiated it does need to be in wet storage for
12 a certain amount of time based on the cask designs that
13 are currently available, and at this stage, typically,
14 as the spent fuel pools have a number of assemblies in
15 them and licensees do move the older fuel into dry casks.

16 And the question that was posed to us was,
17 does it make it safer if they move all of their older fuel
18 into the dry casks, because is there enough of a safety
19 benefit to warrant regulatory action? And based on what
20 we have done so far, although our work is not yet
21 complete, we do believe that there is not enough of a
22 safety increase to warrant regulatory action as far as
23 requiring that the older fuel be moved out of the pool.

24 MS. LEWISON: Thank you.

25 MR. SHERON: This is Brian Sheron. I just

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1 want to add that, you know, I think Zion's been shut down
2 for quite a number of years now, and I would imagine that
3 the fuel in their pool is cool to the point where the
4 concerns that, you know, we've been talking about here
5 about the potential for any kind of a fire if cooling was
6 lost and stuff, is not probably applicable to that pool.
7 I mean I would imagine that fuel can be air cooled if the
8 cooling was lost.

9 MS. LEWISON: What you are saying is that
10 the situation at Zion as you know, as you said, this has
11 been closed down for many years, was outside the scope
12 of your study, if I understand you correctly?

13 MR. SHERON: Yes, just because of the age
14 of the fuel since it's been removed from the reactor.

15 MS. LEWISON: Thank you.

16 MR. RAKOVAN: Okay, let's go to Rod
17 McCullum, then followed by Gail Comer and Sherry Lewis.
18 And just to remind you all we do have a hard stop at 5
19 o'clock, unfortunately, so we'll try to get to as many
20 people as we can in the time that we have remaining.

21 Mr. McCullum?

22 MR. MCCULLUM: Thank you. I'm Rod
23 McCullum of the Nuclear Energy Institute representing
24 the nuclear industry here today. I want to thank the
25 staff for providing this forum and for doing this study.

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1 It's a very informative and useful study.

2 We believe the forum you're providing here,
3 and I understand this is the second such forum, is a good
4 example of openness. Your report has been subjected to
5 a lot of scrutiny here today, and I feel that is just one
6 of the strengths of our regulatory process that we get
7 this kind of discussion. It has been very interesting,
8 a lot to think about.

9 I do want to, as I say, lend the industry
10 perspective, which of course begins with our very strong
11 felt belief and something we've been demonstrating by
12 meeting the regulations with plenty of margin that both
13 the pools and the casks are safe. This really
14 comes down to a decision as to what is the most prudent
15 thing to do, and in that context I want to emphasize
16 something that Kevin Witt said this morning that I think
17 is extremely important, and it's in Appendix D of the
18 report, but it is a very important aspect of this, is that
19 accelerating the movement of used fuel out of pools and
20 into casks does not simply mean you are loading the casks
21 faster.

22 It means you are loading more casks, because
23 the younger you go down to the more into that inventory
24 of fuel that's hotter you go, the less able we are to load
25 the higher capacity casks. We manage that very

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1 carefully to keep radiation exposures to our workers as
2 low as possible.

3 So you are, as is indicated in Appendix D
4 and as Kevin referred to, it's not a question of loading
5 the casks faster, it's a question of loading a lot more
6 of them. And I think as you went further down that road
7 it would be even more.

8 So this is not just a question of, well,
9 we'll just throw a couple more million dollars at the
10 problem. This would be a significant strain on a lot of
11 very scarce resources. It would be taking resources
12 away from things that have been shown to be of value to
13 protecting public health and safety to something that
14 we're seeing from this report is not a value of protecting
15 health and safety.

16 It would be a strain on our radiation
17 protection resources, the skilled individuals we have
18 that make sure that we keep radiation exposures as low
19 as reasonably achievable on every cask loading campaign.
20 It would be a strain on our industrial safety resources,
21 the same resources that assure we manage all those heavy
22 loads.

23 The nuclear industry has one of the most
24 impressive industrial safety records of any industry out
25 there. It's even safer than working in most office

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1 environments. So these are resources we are very proud
2 of. They are resources we are very proud of. They are
3 resources that are very scarce.

4 These are skilled individuals. The people
5 who would operate these loading campaigns, the skilled
6 people who work our refueling floors, who work our
7 outages, who do all that in a safe and timely manner,
8 those would be resources that would be strained. There
9 really is a high bar for having to show a safety benefit
10 here.

11 All of those resources are bounded by the
12 price of electricity. And indeed probably the most
13 significant issue is here is our ability to provide
14 electricity in a clean, safe and reliable manner.
15 Public health and safety all over the country depends on
16 that.

17 Nuclear energy does not release harmful
18 pollutants into the air. The health effects of those
19 pollutants are absolutely known and they are absolutely
20 certain. They are avoided if we are able to operate
21 within the price of electricity and produce clean air
22 energy. And of course we are very concerned as the
23 Nuclear Energy Institute has expressed on behalf of the
24 industry on many occasions about the cumulative impact
25 of additional regulatory burden.

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1 So we appreciate the staff giving such
2 strong consideration to this choice and weighing it with
3 the sincerity that you are. And I think when you do that
4 and you look at the impacts that would result from
5 accelerating the movement of fuel out of the pools and
6 compare that to what, I believe, is the most fundamental
7 conclusion of your study, which is that after a couple
8 months for the plants studied under the assumptions
9 studied the fuel is air coolable after a couple months,
10 which means that moving all of that older fuel out there
11 doesn't help with respect to decreasing the probability
12 of an accident.

13 That's not surprising to the people out in
14 the industry who understand the decay heat curves
15 associated with spent nuclear fuel, who understand the
16 nature of this material and understand why the pools are
17 configured the way they're configured. And of course
18 also heat decays because the radioactive elements
19 producing the heat decay.

20 So while you're not making any accident less
21 likely by moving that fuel out, you're also not really
22 making a sizeable difference in the consequences of any
23 unlikely accident. And again here we are balancing
24 theoretical impacts against the very certain strain on
25 resources that would occur.

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1 And this is why that backfit rule that the
2 staff is held to is so important. You're essentially
3 looking at things that are very real versus things that
4 are imaginary. And I say imaginary because there's a lot
5 of distance in between two months and five years.

6 Okay, pull back to three years. Let's say
7 we're going to start changing the practice and move the
8 fuel out after three years. Well, there's still a lot
9 of distance between two months and three years. You've
10 heard a lot of criticisms of the report. You've heard
11 about assumptions you could make differently. You've
12 heard, you know, about you could be more bounding, you
13 could be less best estimate. And this is all a
14 very interesting discussion, but I don't believe when I
15 look at the fundamentals of used fuel and decay heat
16 curves and the radioactive decay and knowing what all
17 those radioisotopes are, I don't believe you'll ever get
18 to the point where that two months and that five years
19 or that three years come together. That's a huge gap and
20 that gap -- do more studies, fine. But I don't think
21 there's a way to close that gap. So to me the obvious
22 conclusion from this is that there is no safety reason
23 to expedite the movement of used fuel to dry cask storage.

24 I did want to say a couple things about
25 criticality. That was brought up. Certainly in these

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1 type of accident scenarios it's not criticality you're
2 concerned about because, you know, you need water for a
3 moderator and you're talking about losing water in pools
4 here.

5 But a statement was made I would like to
6 correct, earlier, about Boraflex and BORALL degradation
7 as if these two things are the same. They are not. We
8 understand in the industry we can no longer rely on
9 Boraflex. We're not relying on it anymore. BORALL we
10 think is different.

11 In general, we think we have plenty of
12 margin, you know, to protect against criticality. We
13 have engaged the staff. We believe that. We know that.
14 We understand we need to demonstrate that so we've
15 engaged the staff on producing some guidance where we can
16 make it more transparent and open just where that margin
17 is, and we certainly encourage the staff to work with us
18 on that.

19 Finally, one other thing that's come up a
20 couple times today I'd like to respond to, and then I'll
21 be shorter than my time I hope. This idea of the
22 statements that came out of NRC in the first 72 hours of
23 the Fukushima accident as being contradictory to what's
24 now being said in the study.

25 What's now being said in the study is what's

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1 consistent with what the experts have believed all along,
2 again it's not surprising. What was surprising to us was
3 that we couldn't explain that building that had blown up.

4 I think NRC should -- I know I was in the
5 NEI emergency response center at that time, and I was
6 really beside myself because I could not believe that a
7 spent fuel accident happened. All of my colleagues and
8 all the experts kept telling me it couldn't have
9 happened.

10 But I couldn't explain the building until
11 I had that, I just remember the a-ha moment when I was
12 looking at an aerial photograph of the site and I saw that
13 the standby gas treatment systems of Unit 3 and Unit 4
14 were routed to the, you know, the same stack. That's a
15 moment of my life I'll never forget.

16 But it goes to, you know, setting the record
17 straight when we say something that's wrong. A lot of
18 statements were put out by NRC that were flat out wrong
19 during that time period. We shouldn't be using those
20 statements as the yardstick for how we react to very well
21 conducted scientific studies.

22 I mean, I think the Japanese people are very
23 thankful that their own government didn't decide to
24 evacuate a 50-mile radius around that site. So this is
25 part of getting it right, this study. It's a good study.

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1 We hope that it will be completed. We hope to see the
2 additional work. We look forward to that.

3 I thank the staff for undertaking this, this
4 is important, and we look forward to continue to engage.
5 Thank you. I don't have a question, I'm sorry.

6 MR. RAKOVAN: That's okay. Do we have Gail
7 Comer on the line? Ms. Comer, if you're on the line could
8 you please hit Star 1 to be identified?

9 OPERATOR: That person is not responding at
10 this time.

11 MR. RAKOVAN: Okay, if I could check to see
12 if Sherry Lewis is on the line. Ms. Lewis? Again, if
13 you could hit Star 1, please, and identify yourself.

14 OPERATOR: And we do have a response at this
15 time. One moment. One moment please. And Ms. Lewis,
16 your line is open.

17 MS. LEWIS: Okay, thank you. I wasn't
18 planning on speaking today, I was just listening. But
19 I am blown away by that last speaker who sounds so
20 authoritative and so confident. I'm sure some of what
21 he's talking about is okay, but boy, there's a lot that
22 I don't agree with.

23 One of the main things I want to ask about
24 is what exactly is your mission statement? Could you
25 please repeat it to me again?

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1 MS. UHLE: This is Jennifer Uhle again from
2 Office of Nuclear Reactor Regulation, and our mission is
3 to ensure adequate public safety with regard to the
4 civilian uses of nuclear material.

5 MS. LEWIS: Well, that's your job but not
6 NRC? Are you different?

7 MS. UHLE: No, that's NRC's job.

8 MS. LEWIS: So then the operative word is
9 adequate, apparently, because it's not then as I hear
10 that it's for public safety and for the environment.
11 What was that statement? Can you repeat that one? Do
12 you understand what I'm asking?

13 MR. SHERON: No, could you repeat the
14 question?

15 MS. LEWIS: The sentence that I have been
16 hearing previously, earlier today, has been something to
17 the effect of the NRC's job is to make sure that the public
18 and the environment are safe. And the word "adequate"
19 wasn't in there. It was that the public is safe.

20 And what I understand is that may be what
21 your mission statement says, but it's quite obvious to
22 me that you are saying that the environment and the people
23 be safe within the context of having a nuclear industry.
24 At no point are you ever considering getting rid of the
25 entire nuclear industry.

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1 Now there are awful things that can happen
2 that people don't expect, and I mean, ask what the people
3 in Fukushima would want now. Would they want no nuclear
4 power, you know, to have happened, now that their lives
5 have been ruined for so many people? I live near Diablo
6 Canyon in a beautiful area, and it would be more than
7 criminal to have this area be no longer allowed for people
8 to live in.

9 And as far as the evacuation goes in
10 Fukushima, the people were not told for two days that
11 there was a problem. They were not told to evacuate.
12 They were not told there was any radiation release. So
13 you ask us to, you know, that you are using conservative
14 estimates and that the work is robust. Those are just
15 cloud words.

16 I'm quite angry, as you can tell, and that's
17 all, really, that I have to say. What you are doing is
18 balancing public safety with nuclear power, and that's
19 not what we want. We want to be safe, away from nuclear
20 power, and you're saying nuclear power is a given. We
21 have to have that for various reasons. We'll make it as
22 safe as we can given that we have nuclear power. Well,
23 take that given away. Okay, thank you, and I'm glad that
24 you had this long discussion all day. Okay, goodbye.

25 MR. RAKOVAN: Okay, let's see if we can get

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1 a couple more speakers in before we hit 5:00. I have a
2 few others that have preregistered to make comments, so
3 I'll continue to go through our list.

4 Carole Hisasue, I'm sure I'm slaughtering
5 your name. I apologize for that. If there's a Carole
6 Hisasue, if you could hit Star 1, please, and identify
7 yourself.

8 OPERATOR: Someone is queuing up, one
9 moment. Carole? Go ahead.

10 MS. HISASUE: Hi. Am I on it now?

11 MR. RAKOVAN: Yes, you are. Please go
12 ahead.

13 MS. HISASUE: Okay. I'm Carole Hisasue.
14 I'm not an expert. I'm not a specialist. I'm just a
15 resident living within ten miles of Diablo Canyon nuclear
16 power plant. And when we talk about the issue of the
17 expedited transfer of spent fuel to dry casks and you
18 start talking about cost effectiveness or cost/benefit,
19 it just horrifies me.

20 Isn't safety supposed to be our priority
21 rather than cost? You know, words like cost effective
22 and cost/benefit, it sounds like the study was written
23 by the industry. I'm from Japan and, you know, I've been
24 to Fukushima and I've lived in Tokyo for most of my adult
25 life.

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1 And I can tell you that the people in those
2 evacuation zones that weren't evacuated are angrier than
3 they can be. I mean, I can use stronger language which
4 I won't. And so, you know, when someone mentions that,
5 oh, they're thankful that they didn't have to evacuate,
6 I think that's completely wrong.

7 And then when you start talking about, you
8 know, there wasn't enough of a safety benefit to warrant
9 expedited transfer of spent fuel that's it's not cost
10 effective, is there a safety benefit or not? And I think
11 we can all agree that there is, and if there is then cost
12 should not be an issue here.

13 I feel like I'm stuck inside a clunker car
14 which should be junked but it's still being driven. And
15 because of it's so old of course there are more chances
16 of accidents, and not only that now it's carrying
17 dangerous nuclear waste in the trunk. And when I ask the
18 driver, why don't you move it away, he tells me, oh, it
19 just costs too much.

20 I just feel like I'm talking to people from
21 another planet sometimes. If it costs too much to be
22 safe, and we're talking about this analogy of the clunker
23 car, I think it's time we get rid of the car.

24 You know, English is not my first language
25 so if, you know, I mis-say things, please, you have to

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1 excuse me. But I'm just getting very upset about this
2 whole study and the fact that it doesn't take terrorism
3 into account. Given U.S. foreign policy, I think that's
4 a very big risk.

5 So the whole study, I think, is incomplete.
6 It's not handled well. It sounds like it was written by
7 the industry. Those are, you know, my comments, others
8 have stated similar, and I hope that, you know, you will
9 study these other issues in depth and to a point that,
10 you know, the public, especially those living near
11 nuclear power plants can be satisfied. Thank you.

12 MR. RAKOVAN: Thank you for your comments.
13 Can we go to Jane Swanson or Elizabeth Bruce, if you're
14 on the line? Jane Swanson or Elizabeth Bruce, if you
15 could hit Star 1.

16 OPERATOR: All right, go ahead.

17 (Recorded message)

18 OPERATOR: Okay, go ahead. You are all
19 queued up.

20 MR. RAKOVAN: Who do we have on the phone
21 line please?

22 OPERATOR: Your line is open.

23 MS. RESON: Whose line is open?

24 OPERATOR: Your line is open.

25 MS. RESON: Oh good, this is Myla Reson. I

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1 have a couple of questions. One is that early on in the
2 call someone from the state of New York asked if
3 transcripts would be available, and we were told that
4 there would be transcripts. And I'm just wondering when
5 they might be available and how do we find them.

6 And then beyond that let me just go ahead and make
7 the comment that when Jennifer Uhle was talking about
8 some of the problems associated with high burnup fuel she
9 seemed to not be aware of the work of Robert Einziger from
10 the Office of Nuclear Materials Safety and Safeguards
11 with the NRC.

12 I think that it would probably be a good idea
13 to communicate with Mr. Einziger and educate yourself
14 about serious problems with respect to dry cask storage
15 of high burnup fuel, the lack of adequate safeguards for
16 high burnup fuel storage at this time and also the lack
17 of certified transport containers for high burnup fuel.

18 It's my understanding from having listened
19 to a workshop in which Mr. Einziger participated earlier
20 this year that the problems presented by the cladding,
21 the zirconium cladding, et cetera, are at this point
22 presenting tremendous challenges with respect to
23 adequate dry cask storage at this time. That's it.

24 MR. RAKOVAN: Excuse me, ma'am. Could we
25 have your name again please?

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1 MS. RESON: Sure. My name is Myla,
2 M-Y-L-A, Reson, R-E-S-O-N, and I'm calling from Southern
3 California, from the San Onofre nuclear waste dump danger
4 zone.

5 MR. RAKOVAN: Okay, thank you.

6 MS. UHLE: Hi, this is Jennifer Uhle, I'm
7 from NRR. And yes, we're aware of the work that has been
8 sponsored by NMSS, Nuclear Materials Safety and
9 Safeguards, being carried out in the Office of Research.

10 And I think what we'll do, because I think
11 there's a bit of an interpretation, that you have an
12 interpretation that differs from that of the agency, so
13 I think that what we can try to do is we will write up
14 and make sure that Mr. Einziger is on concurrence for that
15 write-up and then respond to your concern on the website.

16 I think we plan on posting a few of the
17 questions in written form that we do have a little bit
18 to follow up on. So I think that might help and clarify
19 some of the concerns you raise. Thanks.

20 MS. RESON: Thank you.

21 MR. WITT: This is Kevin Witt. In response
22 to your question about the transcripts, we do normally
23 have a summary of the meeting, and I think we will plan
24 to include the transcript on to the summary. So that
25 will be available.

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1 MS. RESON: When will that be available?

2 MR. WITT: The meeting summaries are
3 typically completed within 30 days following the meeting
4 and we do post them in our online document management
5 system known as ADAMS. So you can look into ADAMS for
6 this meeting and you should see the summary.

7 MS. RESON: Thank you.

8 MR. RAKOVAN: I'll ask one more time if Jane
9 Swanson or Elizabeth Bruce are on the line with Mothers
10 For Peace.

11 OPERATOR: Jane Swanson is available. Go
12 ahead, Jane.

13 MS. SWANSON: Thank you. Jane Swanson, a
14 member of San Luis Obispo Mothers For Peace. I think I'm
15 the seventh or eighth member of our group whose spoken
16 on this call, so of course we thank you for the
17 opportunity.

18 I'll be extremely brief because what I
19 really want you to do is to stop being rude to the people
20 who know the most. So the way you did not allow Diane
21 Curran to question the authors of this consequence study
22 was disgraceful, and the way you cut off David Lochbaum
23 when he had a very interesting line of questioning I
24 thought was also very rude.

25 And as a member of the public I really want

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1 to hear what these experts have to say. So I will stop
2 right there and hope that you get back to Diane Curran
3 and Dave Lochbaum.

4 MR. RAKOVAN: Okay, do we have Mary Olson
5 on the line from Nuclear Information and Resource
6 Service? Ms. Olson, if you're online can hit Star 1
7 please?

8 OPERATOR: No, not at this time.

9 MR. RAKOVAN: Okay, do we have Paula
10 Gotsch? Paula Gotsch? And I apologize if I'm
11 mispronouncing your last name. Again, if you're on the
12 line please hit Star 1.

13 OPERATOR: Okay, one moment. Ms. Gotsch,
14 go ahead.

15 MS. BRUCE: Hello, my name is Elizabeth
16 Bruce. I live within the 50-mile radius of radiation for
17 Diablo. My first question is this. Are you familiar
18 with the Damascus accident? Perhaps you aren't. I know
19 I wasn't. It happened 33 years ago to today. It
20 happened in a small town in Arkansas when Bill Clinton
21 was governor and being visited by William (sic) Mondale
22 who was then senator.

23 What happened occurred in a nuclear silo
24 when a technician accidentally dropped a screwdriver
25 down the silo and inadvertently tore the shield.

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1 Miraculously, an explosion which could have caused a
2 major nuclear explosion and taken out the state of
3 Arkansas was taken care of by the technicians onsite.

4 Now I bring this to your attention because
5 this is what, when we talk about probability we're
6 dealing with, who would have thought that a dropping a
7 tool down a nuclear silo could result in a major nuclear
8 accident? We're dealing with nuclear power, nuclear
9 waste. It doesn't fit into graphs and charts. I think
10 you need to be reviewing it with greater respect and keep
11 the distance.

12 So that was my observation. I've listened
13 today, all day, sitting at my kitchen table, and I come
14 away realizing that this issue is so very, very
15 important. That the fuel rods need to be transferred to
16 the dry cask storage. This will at least give us some
17 security for the present, and we don't know what the
18 future holds. Thank you very much.

19 MR. RAKOVAN: Okay. That actually gets
20 through all the preregistered people that at least I had,
21 and although we checked with a few that unfortunately
22 weren't on the line, I'm going to go to Lauren Gibson
23 who's been taking questions through the webinar all day.
24 Just to give folks who didn't have a chance to ask
25 questions or didn't have time at the mic, if we can get

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1 a few questions before we go ahead and conclude today.

2 So Lauren, if you could give us just a couple
3 questions that haven't been addressed through other
4 discussions today, if you would.

5 MS. GIBSON: The first question is from Tom
6 Clements. Question to NRC staff -- please explain how
7 this study took into account the impacts to spent fuel
8 pool management in accidents of high burnup fuel and
9 spent plutonium fuel, MOX, both of which have higher heat
10 output and lower burnup spent uranium fuel.

11 As the trend is to higher burnup fuel and
12 as DOE is on a search to find reactors willing to use
13 experimental MOX fuel made from weapons-grade plutonium,
14 the impact of the spent fuel forms could be considerable
15 to a spent fuel pool. Thank you.

16 MR. ESMAILI: Well, this is Hossein
17 Esmaili. What we did, if I understand the question
18 correctly, is that we actually did inventory
19 calculations, origin calculations. We calculated the
20 inventory or radionuclides, you know, that Oak Ridge did
21 the calculations. We calculated the decay heat. And
22 these were all taken into account when we did the accident
23 progression. So as far as the decay heat and inventory
24 was concerned, these were taken into account.

25 (Off microphone comments)

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1 MR. RAKOVAN: Mr. Cochran, can you give us
2 a chance? I was ready to step in and ask him to address
3 the MOX fuel issue.

4 (Off microphone comments)

5 MR. RAKOVAN: Well, we appreciate that.
6 Thank you. Can somebody address the MOX fuel or is that
7 outside of the realm of what we can address with the
8 expertise that we have here today?

9 MR. SHERON: I think, you know, the answer
10 is no, we did not take into account MOX fuel for this
11 study. And that, you know, I think that if plants start
12 using MOX fuel and load it into their spent fuel pools,
13 that's something we will have to take a look at and
14 address at the time when that occurs.

15 MS. GIBSON: The next question refers to
16 the NRC staff analysis. It sounds like a small number
17 of people concluded that a partial drain-down is not
18 credible. Federal information has been provided to the
19 public to demonstrate the warrants for that conclusion.

20 I don't mean to sound naive or simplistic,
21 but a mag. 9 earthquake and 19-meter tsunami at Fukushima
22 had not been deemed credible by the responsible parties.
23 My point is that technical risk analysis entails a great
24 deal of epistemic uncertainty, involves assumptions that
25 need to be vetted carefully and so on. In light of the

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1 degree of concern expressed by 26 environmental groups
2 and other parties, might it be premature to close out this
3 tier 3 issue?

4 MS. UHLE: This is Jennifer Uhle from the
5 Office of Nuclear Reactor Regulation. The spent fuel
6 pool study done by the Office of Research did not look
7 at partial drain-down. However, in the Appendix D to
8 that study where the regulatory analysis was done, we
9 made a conservative assumption where we assumed -- excuse
10 me, in the tier 3 analysis that we are working on right
11 now that will be publicly available at the end of
12 September, we made a conservative assumption in any case
13 where there was a pool that could have a drain-down, a
14 partial drain-down, we assumed that the release
15 frequency was 100 percent.

16 So if you look at the probability of the
17 seismic event, we assumed there was partial drain-down
18 and we assumed that no mitigation measures were capable
19 of mitigating it, and we assumed 100 percent of the time
20 that it would be a release. So we conservatively down
21 did the issue associated with partial drain-down when we
22 looked at whether or not the movement to a low density
23 loading in the spent fuel pools would increase safety
24 substantially. Hope that answers the question.

25 MS. GIBSON: The next question. I heard

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1 someone reference an NEI study. Is there a percentage
2 of your research and analysis done for you by the nuclear
3 industry and its supporters such as NEI that you relied
4 on for this study? If so, was there any additional
5 rigor, scientific or otherwise engaged in by the NRC to
6 determine the accuracy or scientific validity of the
7 reports?

8 MS. UHLE: This is Jennifer Uhle from NRR.
9 No, we don't rely on the industry analyses to make our
10 conclusions. Sometimes we need information about how
11 many assemblies are in the pool or things like that, that
12 is, you know, a fact that we need to get from the
13 licensees, and in that case we would use that type of
14 information, but never information that would be subject
15 to any kind of interpretation.

16 MS. GIBSON: Okay, and our last question.
17 As an average, what percentage of spent fuel at nuclear
18 power plants are already in dry cask storage?

19 MR. JONES: I'm sorry, I didn't hear that
20 question.

21 MR. SHERON: What percent is in dry cask
22 storage?

23 MR. JONES: This is Steve Jones at NRR. I
24 think the percentage varies quite a bit from plant to
25 plant. There are a few facilities that have not yet

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1 begun dry cask storage, other facilities have been
2 operating dry cask facilities for well over 20 years. So
3 difficult to give an overall perspective, but I'd say
4 somewhere around 50 percent is now in dry storage.

5 MR. RAKOVAN: Okay. Jennifer or Brian, do
6 one of you want to close?

7 MS. UHLE: Yes, this is Jennifer Uhle again
8 from NRR. And I do want to thank everybody. We've been
9 here since 10 o'clock and we appreciate everybody's
10 endurance and their willingness to raise concerns, make
11 some comments, ask some questions.

12 We hope we did answer those questions that
13 were posed. Public outreach and getting the public
14 output is a vital part of our regulatory process. So we
15 are not completed with the tier 3 study.

16 We will be considering what we heard today,
17 and in fact we do have some questions we need to answer
18 and we will put them, as well as the transcripts from the
19 meeting, and we'll make that available with the meeting
20 summary that should be posted within the next few weeks
21 to three weeks or so. But we'll try to do that
22 in an expedited basis here, because the next important
23 meeting that I do want everybody to be aware of is another
24 public meeting and that will be October 3rd with the ACRS,
25 our Advisory Committee and Reactor Safeguards.

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1 Oh sorry, 2nd, I can't get that date right
2 today. Sorry, October 2nd, to facilitate that and the
3 public understanding, the ACRS's understanding, that
4 tier 3 work, although we are not complete with it, we'll
5 make what we have available, publicly, in late September.
6 I've said that.

7 But of course we will be considering what
8 we heard today. So again, I thank you. It was a long
9 day but you got us thinking. You saw us looking back and
10 forth to identify the appropriate speaker here because
11 you raised some good issues and we hope we communicated
12 effectively with you.

13 So thanks to everyone. Thanks to everybody
14 on the phone and our facilitators here today, and safe
15 travels to everyone.

16 (Off microphone comments)

17 OPERATOR: Are you taking questions on the
18 phone?

19 MS. UHLE: We have a speaker here today in
20 the room that's asked for these last four minutes, so I
21 think we can have one more question and he's here. So
22 that's what we'd like to do.

23 MR. COCHRAN: In the designs, in the
24 reference study where you're saying the probability of
25 an earthquake was 1 in 60,000 per year, how much would

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1 that frequency have to increase for you to flip your
2 decision on whether or not it would, cost effective to
3 expedite the removal of spent fuel? I want to understand
4 where we are in probabilities to reverse the decision,
5 because I think it has application to the security issues
6 that which are not addressed in your study.

7 And then one last question or comment. If
8 you believe what you say and you ought to advise the
9 Congress against consolidated offsite storage, because
10 your conclusions would argue that it is not cost
11 effective.

12 MR. SHERON: Just to respond, I'm not sure
13 when you say, you know, how would the frequency have to
14 increase before it would turn around our conclusion.
15 Because obviously when you go to a higher frequency
16 earthquake the magnitude goes down.

17 MR. COCHRAN: No, no. No, for the
18 earthquake you assume --

19 MR. SHERON: Just mean the probability.

20 MR. COCHRAN: Probability. Increase the
21 probability, when do you flip?

22 MR. SHERON: Yes, I'm going to have to ask
23 Fred if he has any insights on that, since you did a
24 cost/benefit.

25 MR. SCHOFER: I didn't do a break even

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1 calculation to do that, but in the reg analysis, if you
2 recall, the spent fuel pool study looked at a particular
3 seismic event and that is that 1:60,000 year earthquake.

4 In the reg analysis, not only did I consider
5 that earthquake, but I considered the more energetic 1.2G
6 earthquake as well, plus numerous other initiators that
7 could challenge spent fuel pool cooling or integrity.

8 And so that total set of initiators were
9 considered which are well, you know, although the seismic
10 were the dominant, I combined two earthquakes plus other
11 initiators and we came to that conclusion in Appendix D.
12 So it would have to be, you know, even more than what I
13 already considered, but I didn't do a break even.

14 (Off microphone comments)

15 MS. FINCH: At this time it is 5 o'clock.
16 I'd like to thank you very much for your time and
17 attention today.

18 OPERATOR: All right. This completes
19 today's conference. You may disconnect at this time.

20 (Whereupon, the foregoing matter went off
21 the record at 5:00 p.m.)
22
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